

# EUROPEAN ACTION PLAN FOR STRENGTHENING THE KNOWLEDGE BASE OF SUSTAINABLE COASTAL AND MARINE MANAGEMENT



Paris Conference 5-7 December 2007

**Europe.**

**Your history and destiny so  
strongly tied to the sea...**

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## **APPENDIX 1**

Preliminary Contributions to the theme Action Plans

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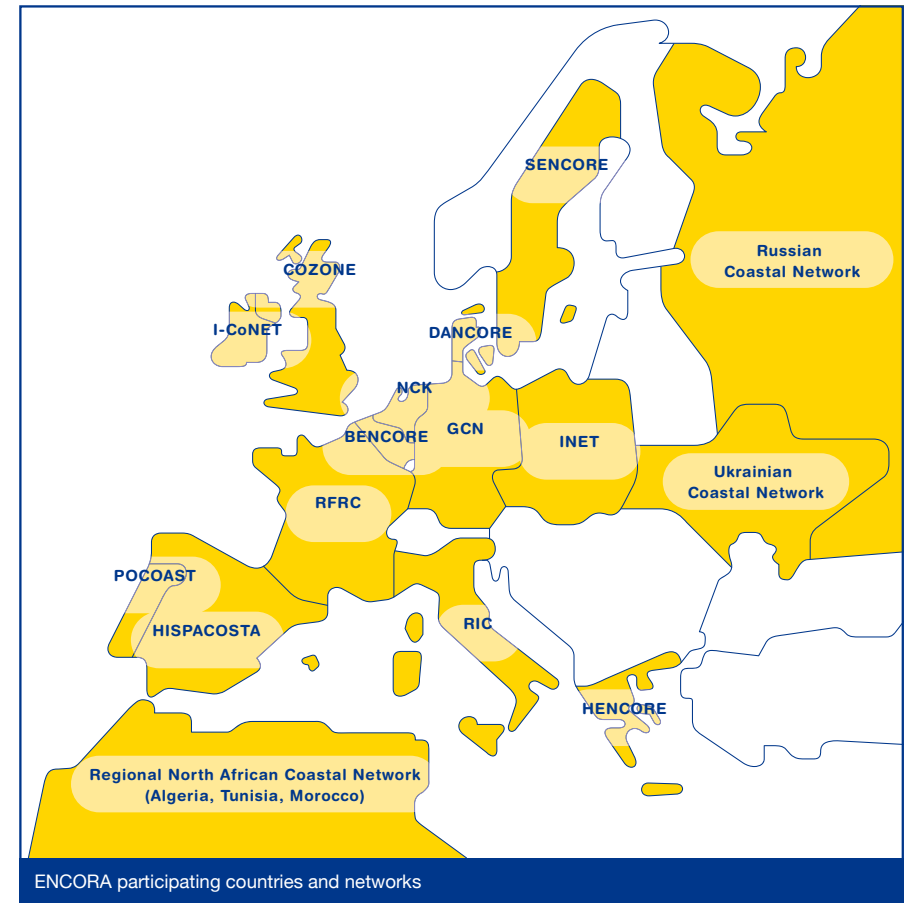
European Action Plan on Capacity Building for Integrated Coastal Zone Management in Europe (FULL VERSION)

**THE APPENDICES OF THE EUROPEAN ACTION PLAN CAN BE VIEWED ON OR DOWNLOADED FROM THE ENCORA PORTAL**

[http://www.encora.eu/coastalwiki/European\\_Coastal\\_Action\\_Plan%2C\\_2008](http://www.encora.eu/coastalwiki/European_Coastal_Action_Plan%2C_2008)

# → PREFACE

**THERE IS PROBABLY NO OTHER REGION IN THE WORLD WHERE SO MUCH EFFORT IS SPENT ON COASTAL MANAGEMENT AND COASTAL RESEARCH AND WHERE SO MANY ORGANISATIONS ARE INVOLVED.**



Throughout the EU there are more than 300 institutes for coastal and marine research, employing some 10,000 scientists. The number of organisations dealing with policy and managerial issues related to the coastal zones and adjacent seas is even larger.

Many similarities exist among studies and projects carried out in Europe and there is clearly a great potential for optimisation by learning from mutual experiences and by joining research efforts. However, fragmentation over many countries, adminis-

trations and institutes is a serious obstacle to taking full advantage of Europe's rich capital of knowledge and experience.

The ENCORA initiative, launched in 2006, addresses the issue of fragmentation in European approaches to coastal and marine management. ENCORA stands for European Network on Coastal Research, a Coordination Action co-funded by the EU 6th Framework Programme. It is built on national coastal networks established in 13 EU countries and 5 non-EU countries and on 10 thematic networks, see figure.

The national networks facilitate sharing knowledge and experience among scientists, policymakers and practitioners in each country; the coordination offices of these networks also work together to facili-

tate sharing knowledge among countries. Each of the thematic networks addresses a particular topic relevant to coastal management and is led by an institute with outstanding expertise in this topic.

## Encora thematic networks

- |                                                                                             |                                                                                      |
|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>01</b> Multifunctionality and Valuation</p>                                           | <p><b>02</b> ICZM Participation and Implementation</p>                               |
| <p><b>03</b> Marine and coastal spatial planning</p>                                        | <p><b>04</b> Pollution, prevention, detection and mitigation</p>                     |
| <p><b>05</b> Long term coastal geo-morphological change</p>                                 | <p><b>06</b> Effect of development and use on eco-morphology and coastal habitat</p> |
| <p><b>07</b> Restoration and preservation of coastal biodiversity: ecological valuation</p> | <p><b>08</b> Sustainable coastal engineering techniques</p>                          |
| <p><b>09</b> Assessment of field observation techniques</p>                                 | <p><b>10</b> Capacity building, training and education in ICZM</p>                   |

Two major tasks of the thematic networks are:

- 1 producing a European knowledge base for coastal and marine policy, practice and science;
- 2 producing the present European Action Plan, which identifies major shortcomings in knowledge and technology that presently hamper sustainable coastal and marine management.

**The European knowledge base for coastal policy, practice and science is established as a wikipedia, the Coastal Wiki.**

It presently contains some 900 articles and definitions, covering a wide range of topics relevant for coastal and marine management. It is continuously improved, updated and extended by some 2500 expert users registered in the ENCORA Contact Database. At the end of 2007 a State of the Art overview has been published on best available knowledge and practices on 'Major Issues in Coastal Policy and Practice, Related Knowledge and Tools', containing a critical analysis of the Coastal Wiki content.

**Taking full benefit of the European potential of knowledge and experience also requires strengthening the cohesion among research and monitoring activities. Sharing the same vision on research priorities is an important precondition.**

Therefore ENCORA has initiated the **European Action Plan**, which provides a reference base for future coastal and marine research investments in Europe and contributes to focusing these research efforts. The foundations of the Action Plan were laid at the Paris Conference of 5-7 December 2007, starting from the research directions set forth in the Aberdeen Declaration<sup>1</sup>.

One hundred and eighty experts in different disciplines, invited for their outstanding expertise, submitted their personal ideas on critical knowledge gaps before the conference. These ideas were discussed in ten parallel workshops led by the ENCORA theme coordinators; each workshop was targeted at a specific aspect of coastal and marine management. The Coastal Wiki State of the Art overview acted as a basis for the discussion on the European Action Plans for each theme.

<sup>1</sup> The ABERDEEN DECLARATION a new deal for marine and maritime science – 22nd June 2007  
[http://ec.europa.eu/maritimeaffairs/declaration\\_en.html](http://ec.europa.eu/maritimeaffairs/declaration_en.html)

Separate theme workshops were run in parallel:

- To analyse the ideas contributed, individually, in the preparatory phase before the conference.
- To identify the most crucial missing knowledge links to which future concerted European research effort should be dedicated.
- To cluster and rank these ideas, so as to reach a consensus-based set of research priorities.
- To provide precise, well focused, concrete and challenging proposals.

The Action Plan consists of an overall synthesis and the underlying ten thematic sections. Each thematic section introduces the theme by describing the theme rationale, objectives, specific topics of interest and the prominent conclusions of the State of the Art report. The initial identification of knowledge gaps follows, which are discussed prior to conclusion and presentation of the final agreed Action Plan contributions.

**The aim of generating the European Action Plan is to provoke a wider dialogue about strategic coastal and marine research planning among research groups, programmes, initiatives and institutes in Europe.**

The Action Plan will be presented for endorsement and implementation to national and European institutions responsible for planning and funding of research programmes. Individual researchers also play a crucial role by focusing their research programmes and proposals to issues identified in the Action Plan.

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# → ACTION PLAN SYNTHESIS

THE ACTION PLAN ADDRESSES MAJOR SHORTCOMINGS IN KNOWLEDGE AND TECHNOLOGY THAT PRESENTLY HAMPER THE IMPLEMENTATION OF SUSTAINABLE COASTAL AND MARINE MANAGEMENT.

The action plan provides a reference base for future coastal and marine research investments in Europe and contributes to focusing these research efforts.

The synthesis highlights major recommendations for action emerging from the Paris conference in December 2007.

## ACTION

### THE CONCERTED DEVELOPMENT OF A EUROPEAN NETWORK OF COASTAL AND MARINE OBSERVATORIES

The observatories are development centres for the coherent collection and analysis of coastal and marine monitoring data, where innovative methods for observation and data processing are combined with advanced process-based modelling. In these observatories, data collection, analysis and model development are carried out in an interactive way, to increase our understanding of the complex interactions in coastal marine systems. Interactions are considered among natural processes (physical, chemical, biological) and societal processes (economic, social, cultural).

This action is deemed crucial to advance our capability to forecast the response of coastal and marine systems to natural and anthropogenic change, including climate change and pressures resulting from development and exploitation.

#### WHY ACTION 1?

In the past decade the performance of numerical models has substantially improved; they are more stable and run faster with higher spatial resolution. Application in real-world situations reveals that, although serious progress has been achieved in predictive power, calibration with field data remains necessary. The fact is that we are not yet capable to model the full complexity of interactions existing in nature. Most of these

interactions are not reproducible in the laboratory; understanding depends crucially on field observations. However, the high natural variability in field situations, both in space and time, presents a major difficulty – we cannot control natural conditions to single out particular trends. We have to cope with this variability and therefore a major investment in better field observations is a prerequisite for making progress. Better means: more

systematic, more consistent and more comprehensive. Present field programmes do not fulfil this requirement. The effort needed for such observational programmes is beyond the possibilities of single institutions or even beyond the possibilities of single countries.

A coordinated effort at the European scale is required. This was a major recommendation of most thematic workshops, and is addressed by the generic action for the concerted development of a European network of Coastal and Marine Observatories.

**ACTION**



**THE CONCERTED DEVELOPMENT OF A EUROPEAN NETWORK OF CAPACITY BUILDING RESOURCE CENTRES**

The Capacity Building Resource Centres cooperate in the development of education and training curricula for coastal and marine resource management. They also develop methodologies and tools for marine and coastal spatial planning, for involving public stakeholders and for performing integrated assessments. Methodologies include instruments for observation and analysis of societal processes, the definition of appropriate process indicators, communication tools and approaches for effective public participation and science-policy dialogue.

The strength of the concept of Capacity Building Resource Centres stems from the interaction between practice and policy training and the development of management tools.

**WHY ACTION II?**

The interaction between science and policy is generally weak, available knowledge is not effectively used and institutional capacities are not well developed. This is illustrated by inconsistencies between land and sea planning, by inconsistencies among existing environmental regulations and by the lack of instruments for their implementation, including the communication with stakeholders and the public. Existing mechanisms to inform policy makers, planners and managers of

the coastal and marine environment are not adequate. Essential information on social and economic drivers and their spatial impacts is often not available. There is an urgent need for strengthening the interface between science and policy and for the development of tools that can be used in practice by policy makers and planners. This is addressed by the second generic action for the concerted development of a European network of Capacity Building Resource Centres.

**ACTION**



**MODELLING OF COASTAL AND ESTUARINE MORPHOLOGICAL PROCESSES**

A European concerted effort is needed for extending the time horizon of coastal morphologic evolution forecasts. This forecast horizon should encompass the planning time scale of adaptive management strategies in response to climate change. Research will focus on understanding and modelling key processes ruling morphological evolution in the different coastal types along the European shoreline. It will combine theoretical research, including the analysis of coastal feedback processes, with field observations.

**WHY ACTION III?**

Obsolete (damaged, malfunctioning) coastal defence structures are widespread along the European coasts, entailing considerable risks for coastal populations and for coastal environmental values. Practical guidelines are needed for restoration, removal or replacement of these structures following building-with-nature principles and respecting Natura

2000 requirements. The development of such guidelines requires generic knowledge for understanding shore-structure interaction and long-term coastal behaviour, taking into account the great diversity and variability of coastal environmental conditions and considering the impact of climate change.

**ACTION**



**DEVELOPMENT OF TOOLS FOR EVALUATING POLLUTION RISKS AND IMPACTS**

The development of effective prevention and mitigation measures and the harmonisation of existing regulations is hampered by crucial knowledge gaps regarding the fate of pollutants and their long term impact.

**WHY ACTION IV?**

Marine pollution remains a major threat. Increasing maritime traffic entails greater coastal pollution risks, both in size and frequency. Coastal pollution risks are also

enhanced by land-use change in the upstream catchment area and by river regime change related to climate change.

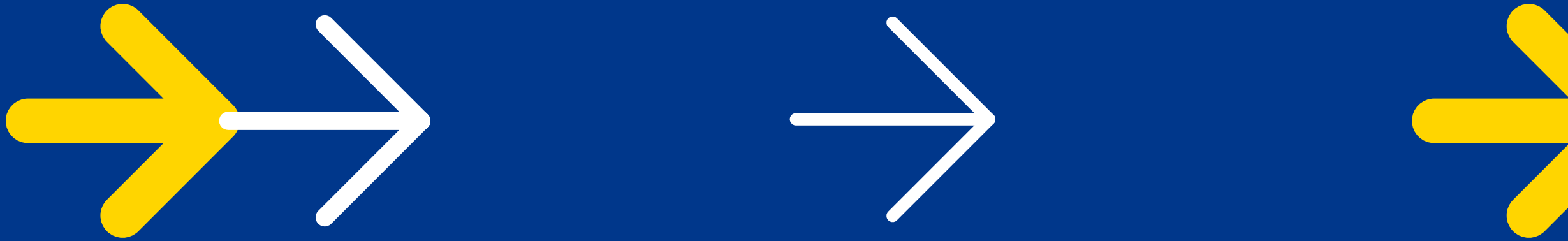


## IMPLEMENTATION

**The highest ranking actions I and II go further than the usual project-based cooperation. They call for a fundamental change in the way knowledge is produced and applied in the coastal and marine fields. They imply a revision of the relationships between science, policy and practice in the member states and European Institutions. A much closer interaction is required, if we want to strengthen our capacity to deal with the challenges set by climate change, development pressure, trends in environmental quality and extreme events.**

Science-policy cooperation is essential for informing the public and for creating a sense of urgency. The recommended actions for creating networks of Coastal and Marine Observatories and Capacity Building Resource Centres will only be effective if full advantage is taken of the European scale. The European Union can provide important incentives through the European Maritime Policy.

The Action Plan outlines the long-term perspective for structuring the capacity for knowledge production and application in the coastal and marine fields. The realisation requires a carefully designed process. This process should start with generating a broadly shared recognition of the pertinence of the recommendations formulated in the Action Plan, not only in the science community but also in the communities of policy and practice. This process of creating awareness can go alongside a few pilot initiatives in a regional sea context. In these pilots the concepts of Observatories and Capacity Building Resource Centres are explored, as new ways of integrating science, policy and practice. We call in particular on existing European cooperation structures – the European Maritime Policy, the EU RTD programme, the European Research Council and MarinERA – to support and prepare these steps.



# THEME WORKSHOPS

# THEME 01

## MULTIFUNCTIONALITY AND VALUATION: INTEGRATION OF SOCIAL AND ECONOMIC ASPECTS IN ICZM PROCESSES

### THEME 1 RATIONALE

Coastal zones include numerous different functions and uses which depend on the same limited resources and space.

This fact frequently generates conflicts between different types of use. Furthermore, interventions regarding single functions of a coastal zone usually have important impacts on other uses within same area or on a vaster territorial scale. Impacts which climate change is expected to have on Europe's Coastal zones are going to accentuate existing

and create new conflicts among uses. Sustainable decision making and management in such multifunctional areas thus requires the capacity to consider all economic and social spheres and to integrate different interests.

In this context, evaluation approaches offer tools and methodologies which allow the description, analysis and assessment of complex coastal systems, using rational and systematic procedures. These approaches are based on criteria and indicators for establishing hierarchies

of values or for translating values into terms which can be understood by all actors. Therefore they provide the possibility of confronting interests and values of different users and actors coming from different economic and social areas. Using evaluation and assessment techniques, information is provided which can support shared decision making, confronting interests of different stakeholders and users of the coastal area in a co-ordinated and rational manner.

The Thematic Network on Multifunctionality and Evaluation has collected and discussed up to date concepts, approaches, tools and methodologies which can be used as support in complex decision making processes and help coastal zone managers to consider the requests and needs originating from the variety of functions in Coastal zones.

### THEME 1 OBJECTIVES

- Recognizing the problems arising from different and conflicting interests, pressures and impacts which originate from social and economic activities on coastal areas.
- Indicating instruments and strategies for the integration of these conflicting interests into coastal management and decision making processes.
- To inform further developments at the European level. Considerable progress can be made at the European level by networking activities to spread existing examples of good practice and research amongst European partners.

### STATE OF THE ART CONCLUSIONS

The contributions of theme 1 to this State of the Art are grouped in four sections, dedicated respectively to:

- The definition of basic concepts underlying different evaluation approaches
- The description of different approaches at the basis of evaluation strategies, and of
- Tools and methodologies which can be applied to the evaluation in coastal zone management contexts.
- Case studies that provide examples of application of various methodologies.

The integration of aspects deriving from socio-economic pressures into coastal zone management processes is generally recognized as a crucial issue. In ICZM practice, scarce consideration of economic and social aspects in management strategies and decision making processes seriously hampers good practice in coastal zone management, as the resolution of conflicts between uses are shifted to the implementation phase, with the risk of strategies and decisions being altered in an uncontrolled manner. Climate change is going to exacerbate conflicts about scarce resources and will thus increase furthermore the importance of a timely and rational consideration of all interests at stake in processes of a coastal zone management.

**Strategies and instruments for facilitating integration during the phase of formulation and definition of policies and strategies already exist to some extent, but, although approved at a scientific level, they are scarcely applied in a day-to-day practice in coastal zone management.**

## OBJECTIVES OF THE ACTION PLANS

- To identify the key scientific and technical issues for advancing sustainable management of our coastal and marine zones.
- To identify major unresolved issues set by climate change, development pressure, and trends in environmental quality and extreme events.
- To provide a reference base for future coastal and marine research investments in Europe.

Specific issues from the point of view of the thematic network on valuation and multifunctionality are:

- Land use and coastal zone ecosystem integrity
- Science outputs to inform society
- Consideration of transitional waters, urban waterfronts
- Perspectives for future developments of ICZM
- Application of framework approach to climate change Biodiversity loss, ...
- Costs (and benefits) of implementation of ICZM

## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

### ISSUES

Based on the conclusion drawn from the state of the art report, which point to the fact that tools and mechanisms are existing, but scarcely applied or applied in a non-satisfactory manner, the major issue discussed during workshop was the need

of provoking a fundamental shift in approaches to the integration of societal aspects into scientific and technical processes:

- Coastal zones have to be considered as socio-economic complexes;
- Integrated Economic, social and ecologic assessment needs to be promoted;
- Assessments of coastal systems have to be based on a social systems approach.

Arguments which have to be affronted when designing new approaches:

- How does assessment of multiple use functions and social distribution of policy benefits feed into policies?
- How are social values perceived and made transparent?
- How are criteria in integrated assessments quantified?

Elements of future activities will be generally based on elements already existing as for example:

- Assessment of Social Vulnerability
- Assessment of future options for use of maritime resources
- Mapping social preferences
- Scoping analysis for use of value transfer strategies
- Risk assessment, assessment of coastal vulnerability
- Participatory prospective techniques

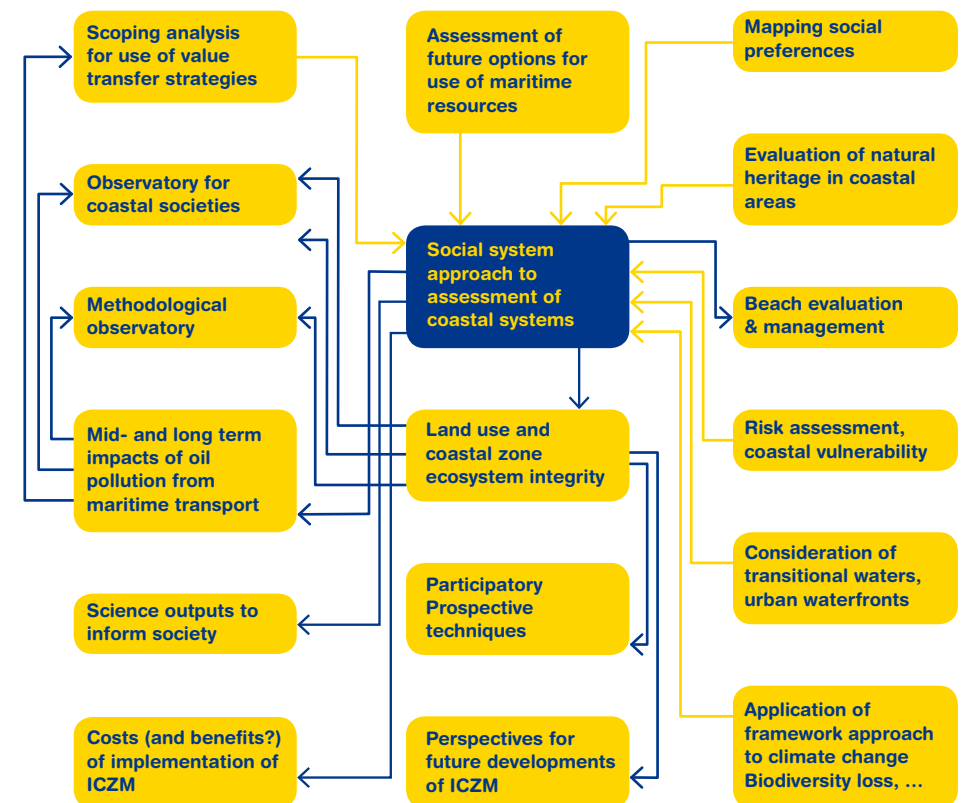
Fields of activity where these arguments have to be applied:

- Climate change: decision support for adaptation strategies
- Evaluation of natural heritage in coastal areas
- Beach evaluation & management
- Mid- and long term impacts of oil pollution from maritime transport
- Integration with broader research agendas: biodiversity change, spatial planning

Some specific tools have been identified, which will be able to support the changes in strategy:

- Observatory for coastal societies, creating an integrated data repository with societal information on coastal zones,
- Methodological observatory, building information on best practice of integration strategies and methods.

The brainstorming activity made during the working Session at the Paris meeting is summarised in the graph below.



Issues and ideas from theme 1

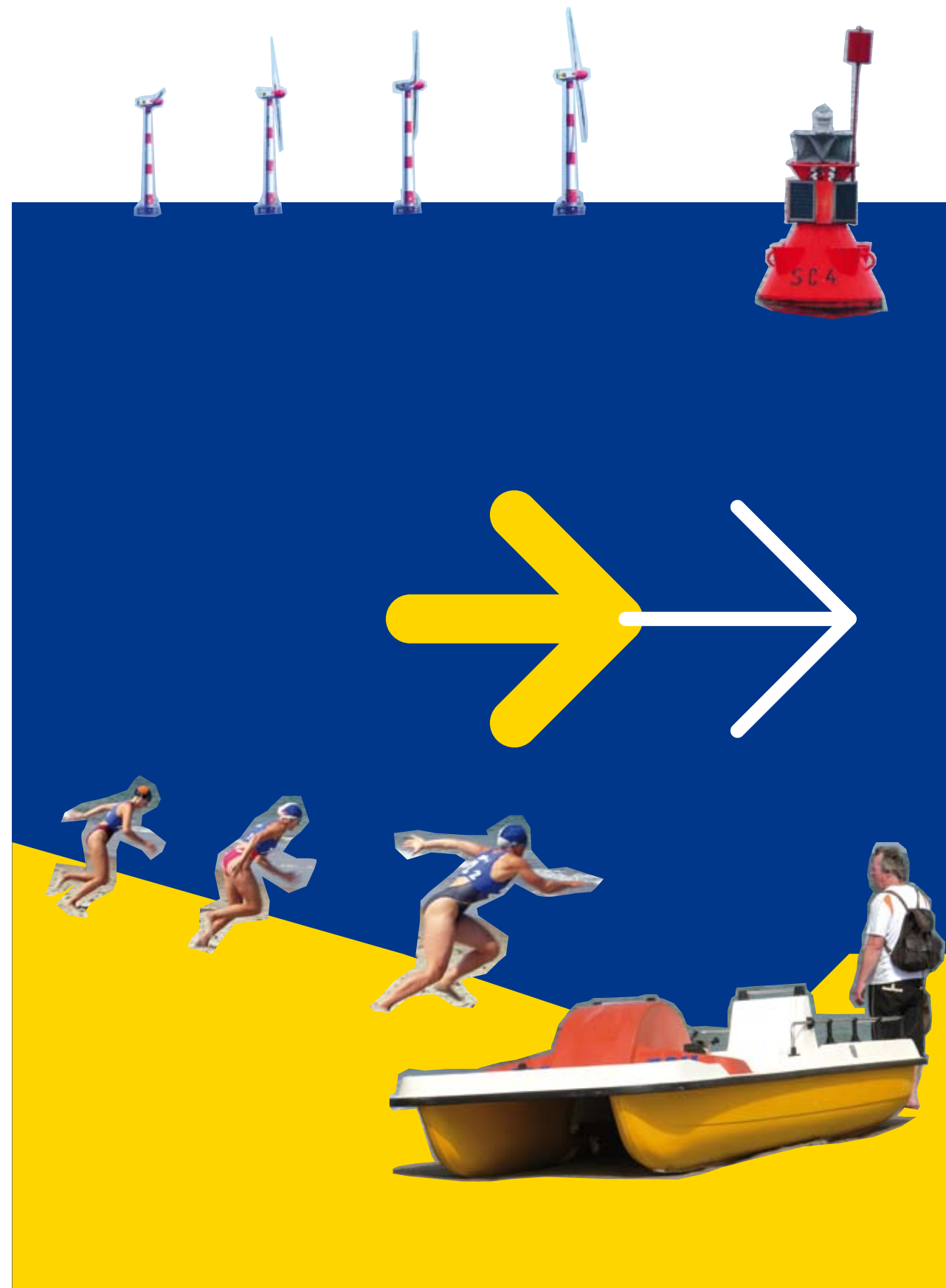
Themes 1 and 2 have independently developed an almost identical recommendation for the action plan.

The fact that both groups independently consider this a priority, although under different names, shows the importance of the issue at hand. Theme 1 has a priority named *'Making sciences talk to society to improve coastal systems sustainability'* and in theme 2 this is called 'Managing the dialogue/communication process between science, administration, and the public on ICZM matters in the most efficient and effective way'. Both workshops address the same issue: the gap between different sciences, specifically social and natural sciences and between science and policy and practice.

This issue is of course larger than just the coastal and marine community. However, due to the integrated nature of ICZM, this gap becomes very apparent and an obstruction to the successful implementation of ICZM.

The chosen methods to bridge this gap differ between themes 1 and 2, but both themes acknowledge that bridging this gap will take time and effort and therefore methods are based on the long term. The ENCORA network suffers from this as well: scientists are overrepresented within the network, with underrepresentation of policymakers and practitioners.

**Themes 1 and 2 suggest that proactive measures for integration between science and practice should be recognized as a priority action for ENCORA and the EU to address.**



The issues and ideas discussed during the session were integrated into the formulation of two synthetic proposals for actions to be undertaken:

**MAKING SCIENCES TALK TO SOCIETY TO IMPROVE COASTAL SYSTEMS SUSTAINABILITY**

**ASSESS AND EVALUATE THE SOCIAL DIMENSIONS OF COASTAL SYSTEMS**



## AGREED FINAL ACTIONS THEME 01

### Assess and evaluate the social dimensions of coastal systems

#### Why?

Management of coastal areas needs more input in the form of information about social systems. It requires the production of integrated knowledge on social system to develop, implement and monitor policies in various domains relevant for coastal areas: fisheries, biodiversity, risk management, climate change adaptation, beach, waterfront, and transitional water management, ...

#### What?

Apply a social system approach for the assessment of coastal systems, adapting

and improving existing instruments for the analysis of societal values, perceptions and knowledge, institutional arrangements, social interactions and for their integration.

#### How?

Support of small and medium-scale projects within and across the different disciplines of social sciences in different coastal contexts and in cooperation with natural sciences.  
Support coordination action to share and capitalize than knowledge.  
Develop instruments for observation of coastal societies and make it accessible to all (policy makers, coastal managers, researchers, ...)

### Making sciences talk to Society to improve coastal systems sustainability

#### Why?

We need integration and mediation of knowledge. Decisions are often made without considering knowledge produced by science. Scientific knowledge is very segmented, there is lack of integration between scientific knowledge and other sources of knowledge, uncertainty and unknown is not enough accounted for

#### What?

Develop knowledge integration tools for Ecological, Social and Economic integrated assessment,  
Apply the systems approach  
Support any attempt to link natural and social sciences.  
Support participatory approaches to retrieve existing information to design assessment outputs

Promote the use of prospective techniques on all levels from local to global.

Use the opportunities of multimedia tools for communication on sustainability issues.

#### How?

Support of small and medium-scale projects based on multidisciplinary research, particularly cooperation among natural and social sciences applied to different coastal issues.  
Support coordination action to share and capitalize that knowledge.  
Provide long term support to communication platforms for dialogue between science and society.  
Create exchange forums for improved communication between science and policy at all levels.

### THEME 1 WORKSHOP PARTICIPANTS

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# THEME 02

## PUBLIC PARTICIPATION AND IMPLEMENTATION OF ICZM

### THEME 2 RATIONALE

In a recent report drawn up by the European Commission on socio-economic costs and benefits of ICM, it was stated that one of the most essential features of ICM is stakeholder consultation and commitment. There are many benefits to public participation in environmental decision making viz.

- The public become more knowledgeable and aware of the different coastal issues,
- Their knowledge and experience can be harnessed to improve plans and policies,
- There is a tendency for improved understanding and support for the decisions that have to be made,
- The process leads to greater openness or transparency in the decision-making process,

- There is generally less polarisation of viewpoints leading to less misunderstandings and disagreements,
- There is an increased tendency to 'own' the decision taken and for the participants to work together to move the process forward,
- It prevents unnecessary delays and costly objection processes, and eliminates aggrieved parties taking their cases to the courtrooms.

**As a consequence of poor participatory methods, the design of most investment projects hardly captures the expectations of the public at large or does not benefit from opportunities brought by local knowledge. In other cases, poor support from the public has forced local and national authorities to withdraw projects including those that would have contributed to restore the long-term resilience of coastal areas.**

It is equally important to follow the status and progress of implementation of ICZM. ICZM has been on the EU agenda for a number of years and progress has been made. However, much remains to be done. It is important (primarily for policy makers, but also for other stakeholders) to monitor the progress of this implementation process. Employing a harmonized methodology with the capacity to share in the collection, interpretation, transformation and dissemination of information will add value immeasurably to the efforts of individual localities, regions and countries and help promote a collective and mutually supportive approach to tackling the challenges posed by coastal and marine issues.

### STATE OF THE ART CONCLUSIONS

For Theme 2, the main Themes in the State of the Art are:

- Public participation in ICZM
- Legislation governing public participation
- Implementation of ICZM

An overview of these Themes can be found on the coastal wiki at:

[http://www.encora.eu/coastalwiki/Theme\\_2\\_State\\_of\\_the\\_art](http://www.encora.eu/coastalwiki/Theme_2_State_of_the_art)

### PUBLIC PARTICIPATION

In Europe, participation most often occurs at the consultation level, generally seen as attitude surveys, neighbourhood meetings and public hearings. Whilst a valid step towards full participation, when it is not combined with higher levels of participation it is not enough. Consultation alone means that there is no guarantee that 'citizen concerns and ideas will be taken into account'. It is important to recognise that consultation is not full participation.

Although existing EU legislation provides a common basis for public participation in the EU, there are large differences between countries in public participation methods and practices.

### ICZM IMPLEMENTATION

So far the results collated from around coastal, EU Europe using the ICZM Progress Indicator show that ICZM is showing good evolution. The Progress Indicator mainly covers aspects of coastal planning and management that are in place and completed in practically all of the countries, even though a sectoral approach is still pre-dominant. However, in many countries a clear framework for ICZM is in

### THEME 2 OBJECTIVES

The ENCORA description of work lists stakeholder involvement in natural resource management as one of the main issues to be addressed in the State of Knowledge relevant to ICZM.

This issue is also at the core of the EU framework programme. Specifically, Theme 2 addresses mechanisms to better involve stakeholders in the management of multiple/conflicting use of natural resources.



existence although both adequate funding and the development of a strategy present the greatest problems.

## OBJECTIVES OF THE ACTION PLAN

- To identify the key scientific and technical issues for advancing sustainable management of our coastal and marine zones.
- To identify major unresolved issues set by climate change, development pressure, trends in environmental quality and extreme events.
- To provide a reference base for future coastal and marine research investments in Europe.

It was the intention to focus the action plans for Theme 2 more on public participation and ICZM implementation practices than on a future European research agenda. Theme 2 focuses on more practical issues than most other themes. These themes focus on science's contribution to coastal issues and to ICZM. Although public participation can be a very valid research topic, Theme 2 focuses on public participation in practice: ICZM projects in Europe.

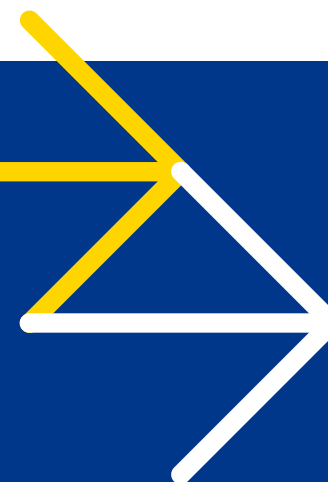
## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

The workshop started with inputs from the workshop attendants. These inputs were usually specific, concrete ideas which focused on small issues. These inputs were then clustered into 9 larger topics. The 9

topics are less specific than the original inputs, but provide a good overview. These 9 topics were then further clustered into the final agreed 2 action plans.

### NINE TOPICS OF INTEREST

- How is participation done in practice?  
Research needed involving governments
- What is and what is not participation in coastal issues?  
Should result in guidelines  
Identify key issues/parameters/issues
- Use knowledge of the public of people really working on the coast
- Trying to understand the process of governance (participation is only part of this), focusing on process indicators
- Role of the local authorities in coastal conflicts in coastal municipalities  
Public opinion poll  
Make a survey on what the authorities are doing. End result: guidelines on how to do better: use local authorities as facilitators to implement ICZM
- Conflict resolution guidelines to be used by local and regional authorities > alternative: analysis of what exists already and if it works or not
- Better collaboration between scientists and managers/policy matters  
For instance: develop practical tools to reach a common view or a coastal issue + understand the feeling and thinking of people (scientists must be prepared to spend some time with translator) + criterium of relevance of scientific research (scientists must make a synthesis - what is relevant)
- How to involve local knowledge with practical experience  
Continued information dissemination of ICZM principles to general public
- Standardise the method of participation across Europe  
Understanding the principles of governance, leading to a diagram with different issues



SETTING THE PARAMETERS FOR PUBLIC PARTICIPATION IN THE ICZM GOVERNANCE FRAMEWORK

MANAGING THE DIALOGUE/ COMMUNICATION PROCESS BETWEEN SCIENCE, ADMINISTRATION, AND THE PUBLIC ON ICZM MATTERS IN THE MOST EFFICIENT AND EFFECTIVE WAY



## AGREED FINAL ACTIONS THEME 02

### Setting the parameters for public participation in the iczm governance framework

#### Why?

To improve consistency and efficiency of public participation in coastal EU

#### What?

Descriptive model of effective PP within the ICZM governance framework; PP standards (definition, objectives, targets), process indicators (do countries/regions have facilitating system, is it working etc) and guidance

#### How?

Comparative research of current PP practices within the ICZM governance framework; defining objectives, targets and PP process indicators; testing and refining the indicators

### Managing the dialogue/communication process between science, administration, and the public on iczm matters in the most efficient and effective way

#### Why?

Communication problems are hampering the implementation of ICZM (self-centeredness, cultural differences between sectors and disciplines etc)

#### What?

analysing communication problems, assessing available methods and approaches from outside and within the ICZM context; compiling and adapting them

#### How?

Communication tool box, incl use of indicators, social science involvement, visualisation tools, awareness raising, social-technical network (with 'translators'), conflict resolution

### THEME 2 WORKSHOP PARTICIPANTS

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# THEME 03

## COASTAL AND MARINE SPATIAL PLANNING

### THEME 3 RATIONALE

Marine and Coastal Spatial Planning is important as a comprehensive framework for policy integration and a process to implement Strategies concerning Coastal Zone Management. At a global, regional (i.e. Mediterranean, Baltic, etc.) and EU level there are various enabling frameworks, e.g. European Parliament and Council Recommendation concerning the implementation of Integrated Coastal Zone Management in Europe and the Barcelona Convention, which support such activities. Such frameworks also exist at a national level; recently a Special Framework for Spatial Planning and Sustainable Development for coastal areas has been adopted in Greece to guide public policy and to provide a policy platform towards ICZM. There is also a wide range of ICZM planning research agendas across Europe.

Theme 3 Coastal and Marine Spatial Planning aims at integrating spatial analy-

sis into coastal and marine management, bridging science and policy making and promoting innovative tools and methodologies for a multispatial and intersectoral coastal and marine spatial planning. These are pursued through a variety of activities and events.

### THEME 3 OBJECTIVES

- Review research progress in respect to marine and coastal spatial planning
- Explore systems for monitoring and evaluating conflict areas and problems
- Incorporate a spatial perspective into marine and coastal planning
- Seek platforms of further strengthening ICZM policies across spatial levels (national, EU, Regional, global) in relation to Sustainable Development
- Link scientific knowledge to policy and planning process.
- Discussion on tools and methodologies

### STATE OF THE ART CONCLUSIONS

Through the Coastal Wiki, the professional coastal and marine wikipedia, coastal and marine practitioners, policy makers and scientists have been invited to share European knowledge and experience in integrated coastal zone management.

Theme 3 has contributed to this action through a series of topics related to the theme's state of the art and covering a wide range of issues in different spatial scales and approaches grouped in six categories:

- Conceptual Approaches - Theoretical Constructs
- Key Issues / Analysis / Priorities for action
- Spatial scales, planning and ICZM
- Methodological Tools
- Policy instruments
- Policy responses

The theme's state of the art conclusions below have been initially highlighted at the Theme's Experts Group Meeting in Athens (Appendix 1):

- Marine spatial planning calls for a strategic approach and is recognized as a key aspect to managing maritime economy, while safeguarding marine biodiversity
- ICZM towards a new system of governance for coastal areas could result to minor impacts, if accompanied with other measures and initiatives
- There is a lack of guiding legislation, lack of funds, lack of a statutory basis and authority for the implementation of ICZM deliverables and there are difficulties related to participation and consultation processes

- Coastal land issues are usually treated through the traditional terrestrial planning approaches and related administrative mechanisms, failing to introduce the fundamental principles of integrated coastal zone management
- Spatial integration requires cooperation and coordination among various authorities, across various levels

**Most coastal and marine areas are facing severe environmental problems and conflicts, stemming from the coexistence between human activities and natural ecosystems. In order to preserve and protect such important environmental ecosystems as coastal areas, it is essential to develop planning policies for the coast.**

### OBJECTIVES OF THE ACTION PLAN

The objectives of the Action Plans are:

- To identify the key scientific and technical issues for advancing sustainable management of our coastal and marine zones.
- To identify major unresolved issues set by climate change, development pressure, trends in environmental quality and extreme events.
- To provide a reference base for future coastal and marine research investments in Europe.

Especially for Theme 3, the main objectives were to identify the challenges, gaps and priorities for Coastal and Marine Spatial Planning in the context of constant changes in coastal and marine environments and in the view of creating a framework for integrated coastal zone management.

## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

The key priorities proposed by experts in Coastal and Marine Spatial Planning emphasize the need of an Action Plan incorporating major issues for science, policy and practice.

People involved in the spatial planning processes in coastal and marine areas all over the world deal with problems and conflicts that need to be identified in order to plan for the future. A few of the most important objectives for marine spatial planning are:

- To identify coastal and marine spatial planning processes on different scales;
- To promote appropriate tools that could contribute to the sustainable implementation of different policies;
- To provide a strategic, integrated and forward-looking framework for all uses of the sea to help achieve sustainable development, taking account of environmental as well as social and economic objectives;
- To apply an ecosystem approach to the regulation and management of development and activities in the marine environment by safeguarding ecological processes and overall resilience
- To ensure the environment has the capacity to support social and economic benefits including those coming from ecosystem services;
- To allocate space in a rational manner, which avoids or minimizes conflicts of interest and, where possible, maximizes synergies between sectors;

- To identify, safeguard, or where necessary and appropriate, recover or restore important components of coastal and marine ecosystems, including natural heritage and nature conservation resources;
- To adapt a common language among scientists, policy makers and practitioners to achieve a common vision for protecting and developing coastal and marine areas.

The inputs from the meeting in Athens and the pre-conference discussions have provided thirteen priority issues for Coastal and Marine Spatial Planning categorized in three major topics:

Integrate spatial analysis approaches into coastal and marine planning

- Explore spatial considerations in policy analysis and planning, and elaborate ideas for structuring planning frameworks to serve marine and coastal planning
- Introduce external drivers in Spatial (Coastal and Marine) Planning
- Promote Transnational Collaboration in Marine Spatial Planning
- Understanding and strengthening European coastal zone stakeholders' coordination

Bridge science and policy in respect to coastal and marine spatial planning

- Develop systems for monitoring and evaluating conflict areas and problems
- Seek platforms for further strengthening ICZM policies across spatial levels (national, EU, Regional, global) in relation to Sustainable Development
- Link scientific knowledge to policy and planning process
- Spatial Planning in Coastal Zones and Marine Areas in view of Natura 2000

Promote innovative tools and methodologies for multispatial and intersectoral coastal and marine spatial planning

- Improve spatial planning implementation through legislation
- Tools for Coastal and Marine Spatial Planning
- Elaboration of a Tool for Comprehensive Estimate of Coastal Planning Process
- Quality Data for a Common Certified Coastal Spatial Planning
- Participation as a Tool for Coastal and Marine Spatial Planning

During the thematic session at the Paris Conference for Coastal and Marine Spatial Planning it was decided by the participants to cluster the suggested topics presented previously to two major challenges for Coastal and Marine Spatial Planning.

The criteria used for the clustering of the topics were:

- The achievability of the proposed action
- The benefits that could be obtained on the part of the stakeholders and
- The contribution of the proposed action to an internal approach/vision.

## HARMONIZATION OF MONITORING, ASSESSMENT AND INFORMATION

## INTEGRATED COASTAL AND MARINE SPATIAL PLANNING



## AGREED FINAL ACTIONS THEME 03

### Integrated coastal and marine spatial planning

#### Why?

The integration between all planning systems (including river basin district plans) is vital for coastal areas. The linkages between MSP and ICZM, MSP and terrestrial planning need to be addressed as well as issues related to spatial and temporal time scales need to be addressed. There is also a need for new and innovative governance mechanisms and participation approaches and mechanisms.

#### How?

It is important to plan frameworks to serve Marine Spatial Planning. One challenge of the 'integration' is the coordination of the different EU recommendation, directives... such as MSP, ICZM, Water-framework directive, Natura 2000, Inspire..., but also Regional conventions (Barcelona Protocol, ...) and national planning policy. The system has to be considered as a specific part of a whole 'terrestrial-water-atmosphere' system.

### Harmonization of monitoring, assessment and information

#### Why?

There is a lack of data, fragmentation, quality issues, lack of spatial information, etc. There is also the need to improve the use of the existing knowledge, to consider decision-maker requirements, to adapt research practices and objectives and knowledge restitution and to improve the access and fitness for use of data .

#### What?

Develop maps and indicators reflecting spatial particularities of European policies and impacts.

Develop shared prospective scenarios at different scales (geographical, organizational, economical, social).

#### How?

Introduce the spatial dimension in monitoring and assessment through specific indicators. Develop a certification protocol for ICZM, concerning data assessment, integration, transfer and use, collaborative and participative methods for active concertation, solutions for data-poor situations, uncertainty etc.

### THEME 3 WORKSHOP PARTICIPANTS AND CONTRIBUTORS

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# THEME 04

## WATER QUALITY, POLLUTION PREVENTION, DETECTION AND MITIGATION

### THEME 4 RATIONALE

Encora theme 4 is about 'Pollution prevention, detection and mitigation' in coastal and marine zones. Pollution is defined as the state of water when it contains a large amount of foreign materials so that it is no longer fit for its intended use, whether it is drinkwater, cold water for the cooling of engines, or clean water for tourism.

This topic, which is of utmost importance for the European commission and national governments due to a number of events which occurred in the last years, covers a broad scope of knowledge including chemical processes of pollutants synthesis, hydraulic transport of compounds, biological impacts on human health or ecosystems, socio-economic consequences of a pollution event and engineering tech-

niques for the mitigation of pollutions. The issue of observing the state of pollution and improving water quality near coastal zones has been addressed in different ways in most coastal countries, through regulations and the organisation of alert and protection systems.

**However, in spite of the great efforts which have been made in the past years to reduce the number of accidental pollutions and the impacts of chronic pollutions in coastal zones, one cannot but notice that a large step still has to be taken in order to improve the understanding of sources and consequences of pollution and to create better warning procedures and reliable tools to mitigate the impacts of pollution.**

### THEME 4 OBJECTIVES

A bad water quality endangers human activities in the coastal zones as well as the environment. Diverse source of pollution threaten the water quality and may be sorted in mostly two types:

- Accidental pollutions which occur after some catastrophic events, are unpredictable and may have a huge impact on water quality, but mostly on a short-term basis, and of which examples are ship accidents and industrial accidents with their environmental impacts due to oil spill or chemical pollution;
- Chronic pollutions due to regular human activities: discharge of oil and paintings from ships, harbour runoff containing a mixture of contaminants (oils, oil emulsifiers, solvents, detergents, bleach), ship's passages and dredging operations which increase the suspended solids contents in water and involving sediments likely to hold heavy metals and organic micro-pollutants, diffuse land-based pollution resulting from agriculture, industry and urban settlement, regular discharge of wastewater from coastal outfalls.

According to the type of pollution, different measures have to be taken to mitigate their impacts and improve their management. For accidental pollutions, the critical point is how the consequences of the accident are being dealt with, first based on an adapted alert system in order to inform authorities and allow them to take decisions while pollutants are still concentrated in a limited territory, then by making tools to evaluate in real-time the evolution of the pollution state and finally be developing and giving access to new technologies

and tools for mitigating the impacts of the pollution. For chronic pollutions, which are well known and can be studied and understood by scientists, the development of observatories may help to identify the most threatened areas and establish priorities for their mitigation. Further analysis can be carried out to find the pollution source and the tools to reduce the pollution level including adaptation techniques as well as strong regulations from local or national governments.

Based on what was agreed by scientists and practitioners in the first Encore meetings, theme 4 is focused on two main unresolved issues:

- Observation and monitoring of pollution: the purpose is first to improve the observation systems and the sharing of information regarding priority substances defined by the EU and the program OSPAR. Pollutants have to be characterized, along with their impacts on biotopes and human health. Sources of chronic pollutions also have to be investigated. This goes through a preliminary diagnosis of pollution state in European coastal seas. A transnational approach has to be adopted since a release of pollutants in a national coast may often have impacts on neighbour countries. In order to target the most endangered sites, a map of pollutants loads (which is different from pollutants amount as it includes a measure of vulnerability) may be drawn from the results of the monitoring system.
- Improvement of risk management with respect to the ecosystems: risk management is an important part of pollution mitigation. A decision making process has to be set up to assess



sanitary impacts of pollution. Vulnerability indexes and sensitivity maps may then be established. Impacts of pollution, including non-direct consequences, for instance on the food chain, can be predicted and evaluated. Since this major goal needs knowledge related to multiple domains and support from users, public and practitioners have to be involved in all the steps of the process, which leads to the necessity of a strong participation process.

In order to reach this goals, theme 4 wishes to create a global understanding of the underlying physical and chemical processes related to water quality and pollution by offering scientists, practitioners and decision makers a way to share their points of view on the topic. The aim is to develop networking between stakeholders, engineers, scientists and legislators working in the field of coastal pollution. These actions should lead to 1) develop guidance on analytical methods to assess the pollution state, 2) guidance on the behaviour of pollutants and contaminants and their interaction on a long-term basis and 3) develop a decision making process to help reduce the level and impacts of pollution.

## STATE OF THE ART CONCLUSIONS

Maritime pollution and water quality are highly shifting topics and techniques and policies related to them are in constant evolution. They gradually integrate new aspects when major events occur through the world, sometimes resulting in human or ecological losses. However, such events always involve a progressive

awareness of the threats and vulnerabilities and feed the improvement of mitigation techniques and prevention policies.

As shown by the analysis, main pollutants which have to be taken care of in Europe include chemical compounds, such as nitrates and phosphates with their effects on eutrophication or anoxia of coastal areas, heavy metals which accumulate in organisms and have strong impacts on their health, oil resulting from regular sailing activities, biological compounds like hormones (endocrine disruptive compounds) and physical processes, for instance the intrusion of saltwater in coastal aquifers resulting on their being improper for drinkwater.

A lot of initiatives have been carried all over Europe and have led to the development of measurement tools, mitigation techniques, and analytical models to help predict the fate of these pollutants. Transport and dissemination models are implemented by universities, but only seldom used for operational goals. Observation and measurement techniques exist but their use has not become common yet. Risk analysis methods have also been developed and tested on specific areas. Nevertheless, all these actions are local initiatives which could benefit from being shared at a European level.

In the same time, while catastrophic events helped to raise the awareness of pollution consequences, national governments followed by the European commission began dealing with the problem by elaborating recommendations and establishing new laws to regulate human activities, based on current scientific studies. Good examples of these first

regulations are the Water Framework Directive, the Marine Strategy Directive and the new Blue Book for a EU maritime policy. Those policies still have to demonstrate their efficiency for water quality management.

As a conclusion, the state of the art elaborated by theme 4 members points out that work still has to be done to improve knowledge and practice for three major unresolved issues:

- observation and monitoring of pollution;
- risk management;
- analysis of the fate and impacts of pollutants.

## OBJECTIVES OF THE ACTIONS PLAN

Since there is some cross-over between the theme Water quality and other themes of the Encora project (adaptation to climate change, restoration of biodiversity in coastal zones, effects of development on coastal habitats), most of the discussions between theme 4 participants at the Paris conference did not deal with physical processes but addressed the current state of pollution in European countries and techniques which can be applied to mitigate the impacts of chronic pollutions.

To launch the discussions, participants were asked to do a small presentation on a specific topic of water pollution based on their field of knowledge, their own experience and their national context. Three issues were thus identified.

## SEDIMENTS CONTAMINATION

This includes the transformation of contaminants trapped in sediments and the fate of pollutants during dredging. One major source of pollution is the human activities resulting of contaminants deposition in sediments, in river or harbours. During dredging, these sediments with their pollutants may contaminate natural biotopes and threaten wildlife.

## PHYSICAL PROCESSES

Although this field is commonly thought as well understood, one has to admit that no reliable operational tool or system has been implemented to predict in real time the fate of a pollutant, for instance to estimate the spreading of petrol after an oil slick. The Prestige oil slick in 2002 is an example where no model was able to predict on which coastal area oil would settle. However decision making processes would benefit a lot of those systems. Other processes, like saltwater intrusion in coastal aquifers, starts to be taken into account but mitigation techniques have yet to be developed.

## IMPACTS OF POLLUTANTS

Many presentations dealt with the impact of pollutants on human health or on ecosystems. Eutrophication and anoxia result from high concentrations of contaminants and are a real threat to biological organisms and, in some cases, for economic activities relying on these products. Numerous examples of polluted waters were given and analysed, from eutrophication near Portugal coasts to anoxia in the Baltic sea.

As a result of the discussions between theme 4 participants, the following tables show the two issues which were considered of utmost importance. There are still knowledge gaps in these fields which have to be bridged and a particular effort has to be made by decision makers to take these issues into account.

**THE FATE AND IMPACTS OF CONTAMINATED SEDIMENTS**

**QUALITY OF NEARSHORE AND TRANSITIONAL WATERS**



**Quality of nearshore and transitional waters**

**Why?**

Pressure of human activities in the coastal zones, including coastal watershed  
Climate change

**What?**

Understanding and forecasting of transport and mixing of pollutants in nearshore waters  
Interaction between groundwater and sea water  
Alterations in biogeochemical processes and nutrient and oxygen conditions  
Assessment of forcing factors controlling biodiversity and ecosystems functioning  
Socio-economic evaluation of impacts

**How?**

Fundamental research on transport and mixing processes at different spatial and temporal scales  
Use of remote sensing and modelling tools for forecast and scenario analysis  
Optimizing design of observation and monitoring networks for surface and groundwater  
Integrated assessment of nearshore and transitional waters (eutrophication and anoxia, biological and chemical pollutants)  
Conceptual tools and protocols for long term assessment of impacts of pollution on ecosystems  
Development of sensitivity index and sensitivity and vulnerability maps

**AGREED FINAL ACTIONS THEME 04**

**The fate and impacts of contaminated sediments**

**Why?**

Development of ship traffic, bigger ships and increased risk of indirect impacts due to dredging and change in dynamics  
Lack of appropriate knowledge to support regulations

**What?**

Better understanding of interactions between pollutants, sediments and bottom water, including integrated assessment of ecological and socio-economic impacts leading to harmonisation of regulations

**How?**

Scoping exercise of different regulations in Europe, and of current state of contaminated sediments, inventory of quantity and quality of contaminated sediments in Europe  
Fundamental research and coupled transport-biogeochemical modelling  
Data acquisition with full scale experiments  
Development of an appropriate ecosystem health index  
Involvement of local practitioners : port authorities, dredging companies, fishermen

**THEME 4 WORKSHOP PARTICIPANTS**

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# THEME 05

## LONG TERM GEOMORPHOLOGICAL CHANGE AND CLIMATE IMPACTS

### THEME 5 RATIONALE

Effective management of coastal systems is crucial to the protection and preservation of all coastal communities.

**All coastal authorities are faced with the need to make predictions concerning the behaviour of the coastline over a timescale of the order of 50 to 100 years in order to fulfil integrated coastal zone management planning requirements. This timescale holds in particular for sedimentary or soft-rock coasts.**

### THEME 5 OBJECTIVES

- To promote the development and demonstration of emerging and new methodologies for the prediction of long-term geomorphological changes to coastal and estuarial behaviour systems; including the effects of climate change and to disseminate this new knowledge across Europe.
- To develop calibrated modelling tools and the framework in which they are used, and also to demonstrate the implementation of this methodology using a standard of data quality and coverage that can be reasonably achieved by European coastal authorities.
- To inform further developments at the European level. Considerable progress can be made at the European level by networking activities to spread existing examples of good practice and research amongst European partners.

### STATE OF THE ART CONCLUSIONS

Within theme 5 the following topics were identified as being of particular relevance for the state of the art, disseminated via the coastal wiki:

- Coastal Processes
- Coastal Classification
- Models
- Policies
- Practices
- Issues
- Case studies
- Data sets

The state of the art report provides an overview of these topics, setting them in context and providing some generic conclusions.

- Our understanding of coastal processes, coastal classifications and the causes of coastal erosion are well established and applied throughout Europe. However quantification of sediment dynamics remains subject to large uncertainties and the prediction of the evolution of coastal features is still subject to conjecture.
- Existing modelling systems designed specifically to make a useful contribution to long-term coastal management planning are still under active development. Process based models are being developed alongside a variety of behaviour based modelling systems, together with statistical and geomorphological analyses.
- Concepts of reliability and risk are being applied in some countries, to provide resilient and sustainable solutions to coastal erosion and coastal flooding, but this is by no means widely applied across Europe.

- The UK Foresight study of flood and coastal defence provides an excellent model for the formulation of policy, which could be more widely adopted across Europe.
- The use of shoreline management plans and the Futurecoast study, pioneered in the UK, are examples of good practice which could be more widely adopted across Europe. The European EuroSION project contains many excellent recommendations for policy and practice that could be adopted across Europe, many of which have not yet been implemented.
- The issue of climate change impacts is an area of rapidly developing research. Policy and practice is still evolving, dependent not only on the science but on the political will to effect the necessary adaptation.

### OBJECTIVES OF THE ACTION PLAN

- To identify the key scientific and technical issues for advancing sustainable management of our coastal and marine zones.
- To identify major unresolved issues set by climate change, development pressure, trends in environmental quality and extreme events.
- To provide a reference base for future coastal and marine research investments in Europe.

## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

### MODELS

Identification of particular modelling approaches that should be developed.

- Semi-empirical and phenomenological models based on common physical principles, to give clearer results than detailed models based on description of numerous elementary processes.
- Verification of modelling systems are required using lab & field studies that are focused on physical mechanisms.
- Good-quality input data required for model calibration and verification.
- Multi-scale modelling tools: Improve accuracy of tools for quantifying climate change impacts at the operational level and for bridging between global & local scales.
- Quantification of the effects of changes in coastal landscape due to water levels, storminess and precipitation.
- Response characteristics of structural defences to hydrodynamic loading; predicting how structural defences alter the shoreline morphology.
- Process based models are important to identify significance of nonlinear/self organisation on morphological development.

### ISSUES

The issues described below have been identified by the Foresight study: Should we pursue these in a European context?

Waves: Improve understanding of how climate change may influence the offshore wave regime in terms of magnitude, frequency and, importantly, direction.

- Promote the link between climatic data, e.g. NAO combined with wave climate change research; co-operation between meteorologists and coastal engineers.
- Nonlinear wave phenomena for the prediction of behaviour in new climatic conditions (freak waves, different types of wave instabilities)

Relative Sea-Level Rise: Probabilistic forecasts for future sea levels, as opposed to the scenarios presently available.

- Co-operation between meteorologists and ICZM experts

Coastal Morphology and sediment supply: Lack of good long-term data sets make it difficult to observe long-term trends and to calibrate and validate long-term models. There are uncertainties in determining the behaviour of coastal morphology beyond that observed in the data. Research agenda designed to overcome this would prove invaluable.

- Hybrid approach to achieve consistent results using process-based models and statistical/behavioural techniques in one framework: to validate & optimise each other's output.
- Probabilistic forecasts for future sea levels together with modern tectonics.
- A European 'DUCK': shingle beach or non-tidal beach.

### POLICY

The UK Foresight study of flood and coastal defence provides an excellent model for the formulation of policy. Could this be more widely adopted across Europe?

- Each country has different administrative approaches: identify best practices and disseminate them across Europe knowing local contexts.

### PRACTICE

The use of shoreline management plans and the Futurecoast study, pioneered in the UK, are examples of good practice. Could these be more widely adopted across Europe?

- Optimum mix of top-down and bottom-up options.

### OVER-ARCHING COMMENTS

- Good-quality input data required for model calibration and verification.
- Improve experimental raw (not averaged) data sharing.
- Refinement of tools for quantification and description of coastal processes.

**DETERMINING THE RANGE OF PREDICTABILITY OF COASTAL AND ESTUARINE MORPHOLOGICAL EVOLUTION**

**DEVELOPMENT OF COASTAL AND ESTUARINE MORPHOLOGICAL PROCESSES AND MODELLING**



**Development of coastal and estuarine morphological processes and modelling**

**Why?**

Existing knowledge gaps in morphological modelling, of importance to coastal management, need to be bridged.

Climate changes will affect the sensitive balances of coasts, estuaries and tidal inlets. The underlying knowledge and tools to quantify the morphological response to changed forcing conditions are not at a level where effects can be accurately quantified.

**What?**

Examples of processes: hydrodynamics in the surf zone, cross-shore and long-shore sediment transport, breaching and collapse of dunes and sandy barriers, interaction between sand and mud.

**How?**

Detailed process modelling supported by field observations. The selection of topics to be studied will be defined after analysis of management needs, such as barrier breaching, coastal erosion.

**AGREED FINAL ACTIONS THEME 05**

**Determining the range of predictability of coastal and estuarine morphological evolution**

**Why?**

A variety of techniques are used to predict future coastal evolution. We need to establish the prediction horizons to improve forecasts for coastal and maritime users.

**What?**

Identification of intrinsic dynamical behaviour and limits on forecast period. Model developments to make predictions over different planning horizons.

**How?**

Theoretical and numerical analysis, combined with comparisons to field observations at a range of space and time scales.

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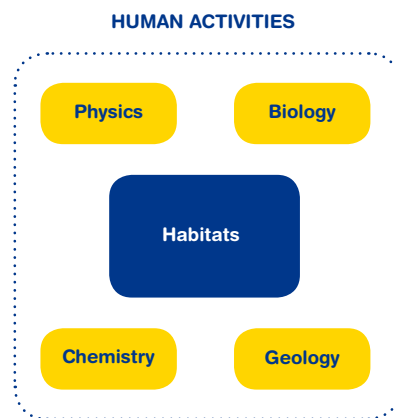


# THEME 06

## EFFECT OF DEVELOPMENT AND USE ON ECOMORPHOLOGY AND COASTAL HABITATS

### THEME 6 RATIONALE

Increased human exploitation and infrastructure developments in the coastal and estuarine zones influence the geo- and eco-morphology resulting in enlarged stress on coastal habitats. These effects of human activities on coastal biotopes are the basis of Theme 6, and the concepts upon which this is constructed are based on system processes including development in time. The evaluation of existing concepts for dealing with habitat change, and the identification of obstacles to effective management (including knowledge gaps) is an important aim of Theme 6. Technologies are identified for the recovery of habitats through the development of coastal environment-focused technologies.



The concept of Theme 6 is focused on the eco-morphology in coastal habitats related to wetlands and estuaries taking into account the various human activities that may influence the area. Above is a

simple diagram illustrating the various human caused impacts that may influence the habitat:

Physical activities include ship traffic, navigational channels, harbours, fishing, and activities from tourism.

Chemical substances such as oil spill, nutrients from agriculture, urban sewage and other topics related to water quality. Biology and geology are the ecological factors in the coastal zone including various biotopes and species from flora and fauna and the sediment dynamics, type of sediment, type of dynamic morphology in the area.

The problem faced is increased human exploitation and infrastructure developments in the coastal and estuarine zones and influencing the geo- and eco-morphology resulting in enlarged stress on coastal habitats.

### STATE OF THE ART CONCLUSIONS

The following topics have been identified and further elaborated for the state of the art, disseminated via the coastal wiki:

- Identification of important processes in the coastal zone related to coastal habitats
- Classification of coastal habitats: spatial and biological characteristics
- Regulations through EU directives
- Key issues affecting the coastal habitats e.g. pollution and climate change
- Tools and methodologies
- Case studies
- Projects and resources

The main theme conclusions can be summarised as follows:

- The impacts of Climate Change on the European Marine and Coastal Environment specifically in relation to coastal habitats is to a certain extent established. It is however an ongoing task to combine the existing knowledge with new and especially to address the pace at which changes undergo
- New and old species in the coastal zone are important with respect to the role of habitat-forming flora and fauna on sedimentation, erosion and ecosystem functioning.
- Key words: anthropogenic factors, biota, physical processes, biodiversity, management, invasive species, coastal morphology, impacts
- Public awareness is an important issue for the future management and use of the coastal zone. Increased awareness and understanding will make the coastal habitats gain from involving the public in processes related to use of the coastal zone

### THEME 6 OBJECTIVES

- To identify appropriate data to support the understanding and quantification of the physical and ecological processes in the coastal environment
- To identify tools to assess and quantify the development- and use-related impacts on eco-morphology and coastal habitats
- To work on potential improvements to the existing tools
- To describe causes based on case studies
- To produce the ENCORA WIKI of well-proven and documented measures
- To share the experiences gained by researchers and practitioners from the application of tools and methods to real-life cases
- To address gaps in knowledge for further intervention



- Eutrophication and its impact on coastal habitats is an issue that needs continuous addressing in order to understand and meet the consequences

## OBJECTIVES OF THE ACTION PLAN

- To identify the key scientific and technical issues for advancing sustainable management of our coastal and marine zones.
- To identify major unresolved issues set by climate change, development pressure, trends in environmental quality and extreme events.
- To provide a reference base for future coastal and marine research investments in Europe.

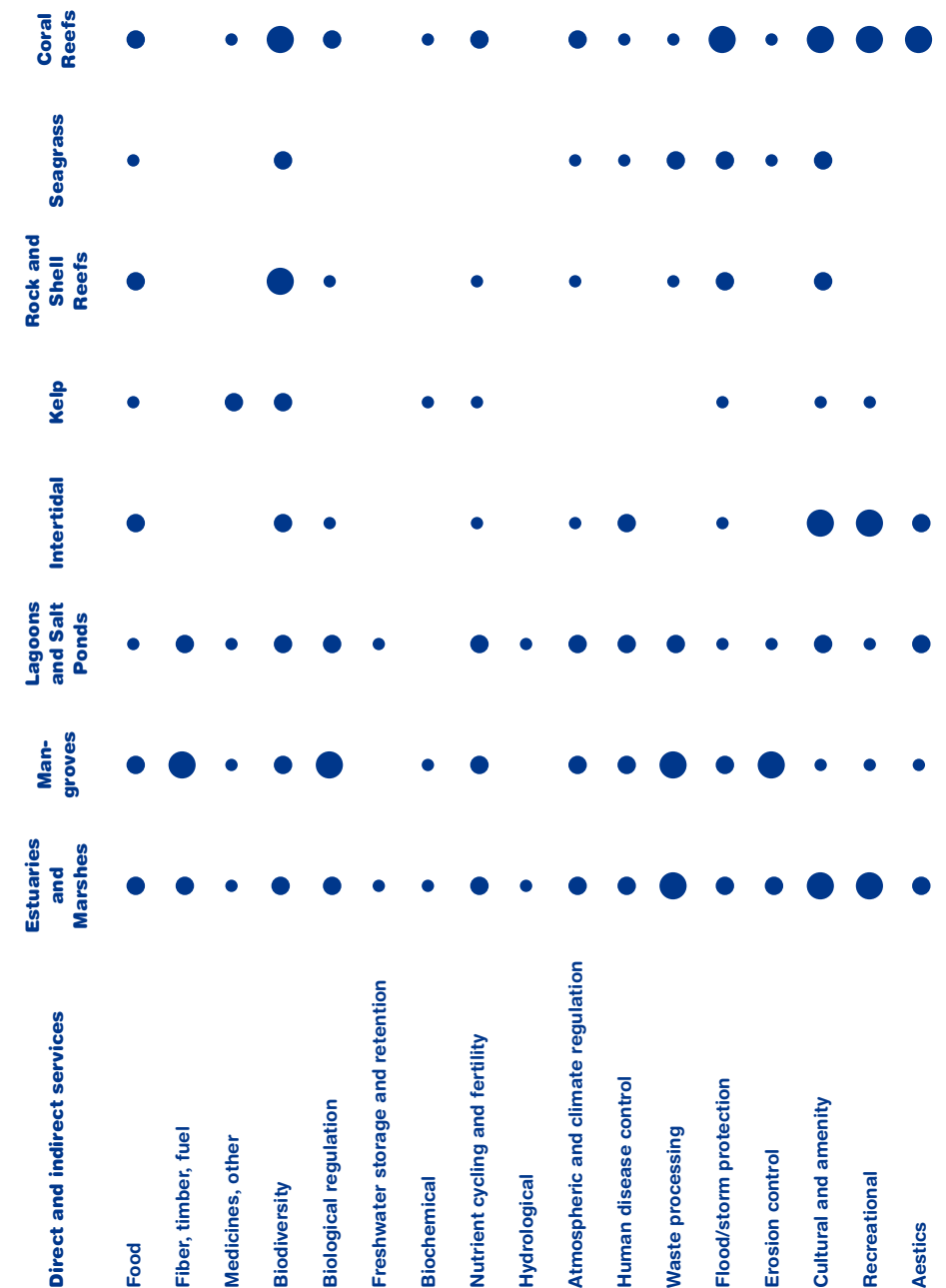
## ROLE OF THE THEME WORKSHOPS

- To analyse the ideas contributed, individually, in the preparatory phase before the conference.
- To identify the most crucial missing knowledge links to which future concerted European research effort should be dedicated.
- To cluster and rank these ideas, so as to reach a consensus-based set of research priorities.
- To provide precise, well focused, concrete and challenging proposals.

## INITIAL IDENTIFICATION OF ISSUES TO BE ADDRESSED

The topics presented in Theme 6 include research on the effects of development and use in different European countries. The goal is to find means to evaluate existing concepts for dealing with habitat change and identifying obstacles to effective management, including major existing knowledge gaps. It is also the vision to identify promising technologies for recovery of habitats through the development of environmental technologies that are focused on the coastal environment. In the table below, an indication of the contribution of ecosystem types to different services is given.

Management needs to address all the direct threats to marine and coastal areas in order to protect and conserve the biodiversity and habitats. The threats to marine habitats are accumulating over time, because there are various sources of impact as indicated in the above table. The Millennium Ecosystem Assessment states that: ‘Marine and coastal protected areas already dot coasts around the world, and the number of protected areas continues to increase. By far the bulk of these protected areas occur in coastal zones, and many include both terrestrial and aquatic components. However, even with the large number of individual sites, coverage accounts for less than 1% of the world’s oceans. Many marine protected areas occur in relatively close proximity to human settlements— in fact, nearly 10% of the world lives within 50 kilometres of a marine protected area, and over 25% of the worldwide coastal population lives within 50 kilometres of one. The figures for Europe are believed to be even larger.’



Summary of ecosystem services and their relative magnitude provided by different coastal subtypes. The larger circles represent higher relative magnitude. (from: Millennium Ecosystem Assessment)

Another aspect is that management effectiveness of most marine protected areas remains questionable even though the Water Framework Directive and projects undertaken under the LOICZ (Land–Sea Interactions in the Coastal Zone) initiative are examples of how management is taken seriously in Europe, aiming at and resulting in lower pollutant loads and improved conditions in estuaries. But the need for even larger integrated water resource management schemes is persistent not least because of the dynamic nature of the water environment.

Some of the major topics identified for Theme 6 are given in the non-exhaustive list below:

- Climate change effects
- Nutrient dynamics
- Pollution
- Human activities and their impact (e.g. fishery, tourism, agriculture etc)
- Threats to the coastal zone, natural and human induced
- Land-based impacts

## REGULATION

The Coastal WIKI articles on regulations are primarily concerned with EU regulations forming the major part of the overall regulations for the coastal zone. They include the overall Water Framework Directive addressing the ecological and chemical status of marine habitats, maritime policies and proposed marine strategies and specific directives addressing EU's policy on nature conservation consisting of two directives, the Birds Directive and the Habitats Directive and NATURA 2000, which is a number of protected coastal areas all over Europe.

## TOOLS AND METHODOLOGIES

Methodologies for assessing the human impact on the coastal habitats vary from Habitat/biotopes mapping and Habitat assessment using GIS, remote sensing and other measuring techniques in the field to dynamic models describing the water-sediment-nutrient interaction to economic methodologies for assessing human pressure on the coastal habitats and the general benefits for the environment. In this respect the idea of ecosystem services needs to be more closely addressed.

**We derive many goods from the coastal ecosystem not least seafood, but also recreational services. These goods represent important and familiar parts of the economy. What has been less appreciated until recently is that this ecosystem also perform fundamental life-support services including purification of air and water, detoxification and decomposition of waste, regulation of climate, and not least production and maintenance of biodiversity.**

Tools addressing the eco-morphology in coastal habitats are varied depending on the aspect under consideration. It varies from field investigations, dynamic modelling, economic assessments and management strategies. One way of learning about others experience is through case studies, continuously being added to the list.

The ENCORA idea is to generate and maintain strong networks within the European coastal community. This is done both through the personal communication among individuals but also through collaboration and exchange of knowledge.

## IDENTIFICATION OF KNOWLEDGE GAPS

- Are the existing ecological models adequate for simulating the processes that we want to highlight in relation to eco-morphology and coastal habitats?
- Do we know enough about the main processes, and do we generally agree on those?
- Is the Blue Book the right tool for the future European maritime policy.
- What are good practises in relation to eco-morphology and coastal habitats? Denmark is known for its extensive data sets from decades of monitoring. Now the monitoring is cut down. Do we have all the data that are needed?

## NEW RESEARCH ISSUES

- Relationship between ecosystem function and the provision of services.
- Identification of ecosystem functions (relationship with biodiversity); quantification of ecosystem services; environmental limits of acceptable change (e.g. biodiversity loss)
- Impact of environmental change on ecosystem services: overexploitation of resources; land use change and habitat fragmentation; climate change; pollution; invasive species
- Restoration technologies for ecosystem services

## CONCLUSIONS DRAWN

Measures of sustainability in an ENCORA perspective attempt to describe the negative impacts between human activities or interventions, ecology and the coastal environment. Measures vary between disciplines: for example, those used in economics may be quite different from others used in areas such as biology and engineering. For biology, which is the most important aspect with regard to coastal habitats, several useful measures have been developed by researchers, and the simpler measures are then often combined into composite measures which attempt to more fully assess the sustainability of the system. The various topics within Theme 6 may have different measures depending on the specific content. Sustainable development is a goal for most habitats, because it ensures the system services to be available at the same time securing the state of the specific environment.

**The Paris workshop gave the conclusions listed above in this section. In summary, they conclude that the impacts of Climate Change on the European Marine and Coastal Environment specifically needs to be addressed with regard to the pace at which changes undergo. In this context, new and old species in the coastal zone are important with respect to the role of habitat-forming flora and fauna on sedimentation, erosion and ecosystem functioning. One of the key challenges is rising the public awareness. Increased awareness and understanding will make the coastal habitats gain from involving the public in processes related to use of the coastal zone.**

During the Paris workshop two final action were identified based on the discussions during the workshop and the findings in the state of the ar report. As they represent the synthesis of the discussion they are in themselves unique.

**COASTAL HABITATS: RESPONSE TO AND RECOVERY FROM ENVIRONMENTAL CHANGE**

**DEVELOPMENT OF AN OPERATIONAL EUROPEAN OBSERVATORY NETWORK FOR MONITORING AND MANAGEMENT OF COASTAL SYSTEMS**



**Development of an operational european observatory network for monitoring and management of coastal systems**

**Why?**

Sustainable management requires a consistent and coherent database to be able to detect changes in coastal habitats. The database should consist of data collected at different temporal and spatial scales and possible gaps should be identified and filled.

**What?**

Analyse and report trend indicators. Develop an alert system for early warning. Create a decision support system for coastal habitats.

**How?**

Set up a network of observatories across Europe to collect, share and interpret core data. Identify core data-sets essential for understanding the changes in coastal habitats with respect to natural and anthropogenic factors.

**AGREED FINAL ACTIONS THEME 06**

**Coastal habitats: response to and recovery from environmental change**

**Why?**

Management of coastal habitats requires tools and methodologies for forecasting their response to environmental changes including sediment management, pollution and climate change.

**What?**

Development of management options addressing sustainability, recovery and restoration of coastal habitats to environmental perturbation

**How?**

Identify and quantify processes and functions, incorporate these into models and develop scenarios of different spatial and temporal scales

**THEME 6 WORKSHOP PARTICIPANTS**

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# THEME 07

## RESTORATION AND PRESERVATION OF COASTAL BIODIVERSITY

### THEME 7 RATIONALE

The continuously increasing socio-economic pressure on the coastal system (e.g. tourism and harbour related activities, coastal defense, fisheries, aggregate extraction and windmill farms) urges the need for a decision-making framework to objectively allocate the different user functions in the coastal zone. This calls for a spatial structure plan, preferentially firmly based on the concept of ICZM. Theme 7 on the restoration and preservation of coastal biodiversity aims at establishing a strategy and protocol to provide an integrated view on nature's intrinsic value. Ecological value is here defined as the value of biodiversity, without any reference to anthropogenic use. As such, the ecological value complements the social and economic valuation within Decision Support Systems. This theme will largely benefit from close collaboration with the

MARBEF NoE Theme 3 in which socio-economic and ecological valuation of the marine environment is aimed at.

### THEME 7 OBJECTIVES

- To identify the already existing national and international strategies for the ecological valuation of the terrestrial as well as the marine part of the coastal zone. They will be used as a baseline for setting the protocol for European ecological valuation in the coastal environment. The results are reflected in a State-of-the-Art document.
- A selected set of case studies along the European gradients in biogeography, in knowledge (well- versus poorly known) and in preservation (e.g. preserved, restored and degraded systems) are used to evaluate the applicability of the

protocol and to identify the most critical information needed to finalize the protocol into a final ecological valuation protocol. This will crystallize in a European Action Plan

criteria and methods (literature review) has been performed. Through international workshops, within the framework of FP6 ENCORA CA and MarBEF NoE, the concept and protocol of marine biological valuation was discussed, which resulted in fine-tuning the concept of marine biological valuation, especially with respect to its applicability to marine areas. Guidelines for a generic biological valuation protocol has been described, set, up and tested on a European scale. These different case studies, allowing to test and fine-tune the Biological Valuation Concept are performed or will be tested. In addition to the overview on valuation of coastal and marine biodiversity and practical guidelines for incorporating biodiversity in coastal and marine policies Theme 7 provides also more general information on marine biodiversity. This information is consulted through the Coastal Wiki and is intended to provide a general overview and some of the issues and policies of marine biodiversity across Europe. Currently, this section is still a work in progress with further contributions expected as the Coastal Wiki grows.

### STATE OF THE ART CONCLUSIONS

Within theme 7 the Coastal Wiki was used to disseminate the State of the Art Overview of the Thematic Network on Restoration and Preservation of Coastal Biodiversity. The SoA summarizes the best available knowledge and practices in Europe on the valuation of coastal and marine biodiversity. Through the concept of Biological Valuation and Biological Valuation Maps (BVM) that can be used as baseline maps for future spatial planning at sea, practical guidelines for incorporating biodiversity in coastal and marine policies are provided. Additionally a general introduction on marine biodiversity, threats to marine biodiversity and case studies across European Seas are available online through the Coastal WIKI, developed within the ENCORA project to provide the most effective tool for networking and dissemination of the State of the Art.

Best available information and knowledge on valuation of marine and coastal biodiversity was collected through an extensive literature overview focussing on 1) Articles on the assessment of valuable ecological marine areas 2) Literature on selection criteria for Marine Protected Areas (MPAs) and 3) International legislative documents that include selection criteria. A scientifically sound and widely applicable concept for marine biological valuation drawing on existing valuation

### OBJECTIVES OF THE ACTION PLAN

When identifying two priorities or European Action Plans three selection criteria were considered. The European Action Plans should

- contribute to remove a major obstacle for sustainable coastal and marine management
- contribute to a major breakthrough in science/technology and
- be feasible within the context of European research cooperation.

Two issues, the Ecosystem Approach and Spatial Planning, were considered of utmost importance for biodiversity assessment in Integrated Coastal Zone Management (ICZM). These concepts highlighted in several European Policy documents (e.a. the Maritime Strategy, the Green Paper on a future European Maritime Policy and the recently published Blue Book: An ocean of opportunity) were addressed in identifying two priorities for European Research.

## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

The Action Plans were discussed with a group of 18 experts during the Paris Conference on marine and Coastal biodiversity across Europe (See Annex). The State of the Art document produced by Theme 7 and the E-conference 'Life on the Blue Planet: Biodiversity research and the new European Marine Policies', organised from the 1st till the 19th October 2007, served as background documents for discussion. The E-conference was organised by the Specific Support Action BioStrat, funded by the EU Sixth Framework Programme. This project involves 34 partners from 32 countries and aims to further develop the EU Biodiversity Research Strategy making wise use of the existing structures.

To ensure the integration of the EAP into running initiatives an extensive summary of the main lines of thought and outcome of the E-conference 'Life on the Blue Planet: Biodiversity research and the new

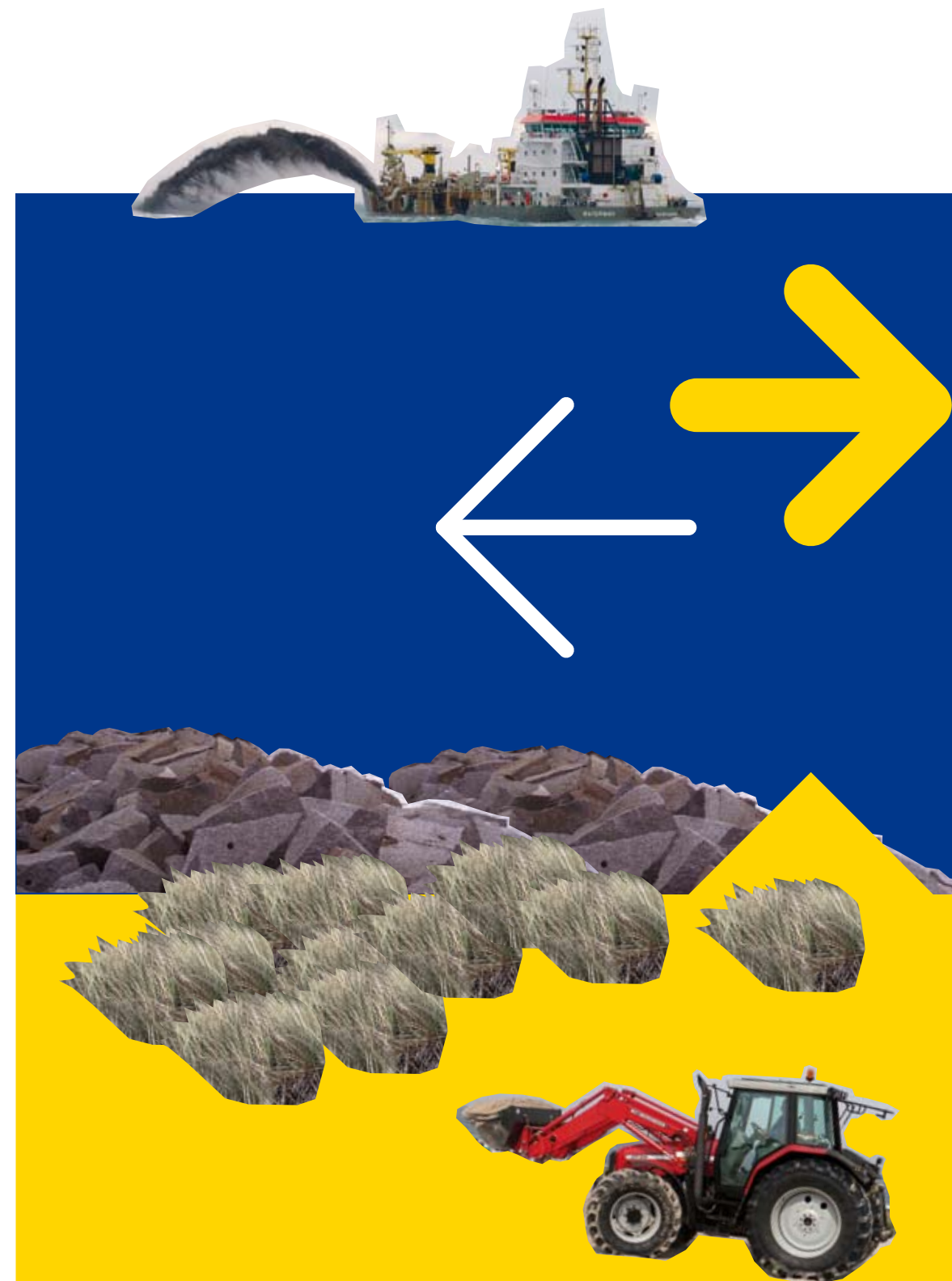
European Marine Policies' was presented to focus and streamline the discussions on identifying the EAPs.

### FURTHER READING

Anon (2006). ENCORA Theme 7 - MARBEF Theme 3 Workshop on Marine Biological Valuation 6-8 December 2006 Ghent, Belgium. 33 pp

Deros, S.; Claus, S.; Vincx, M.; Degraer, S. (2008). ENCORA Theme 7 Thursday 6 December 2007, Paris, France: workshop report. Marine Biology Ghent University/ENCORA: Gent, Belgium. 14 pp.

Young, J., Sousa Pinto, I., Hawkins, S., Serrão Santos, R. and Watt, A.D. (Editors). 2007. Life on the Blue Planet: Biodiversity research and the new European marine policies. Report of an e-conference.



**NETWORKS OF OBSERVATORIES AND REPOSITORIES OF BIODIVERSITY (CHANGE) DATA AND INFORMATION IN THE COASTAL AREA (BOTH TERRESTRIAL, TRANSITIONAL (ESTUARIES, LAGOONS, BEACHES, ROCKY SHORES, .) AND MARINE) AT APPROPRIATE SPATIAL AND TEMPORAL SCALES**

**TO IMPROVE THE UNDERSTANDING OF HOW COASTAL BIODIVERSITY IS AFFECTED BY THE MITIGATION OF CLIMATE CHANGE AND HOW BIODIVERSITY CAN BE USED TO MITIGATE THE EFFECTS OF CLIMATE CHANGE**



**Networks of observatories and repositories of biodiversity (change) data and information in the coastal area (both terrestrial, transitional (estuaries, lagoons, beaches, rocky shores, .) and marine) at appropriate spatial and temporal scales**

**What?**

Sustained observations and interpretation of the 'biodiversity status' of coastal areas (link with biodiversity and habitat mapping) at appropriate spatial and temporal scales

**How?**

Continuation of data gathering, filling gaps in knowledge and setting up good data policy agreements in order to share data (across national borders)  
Continuity of EU-networking: NoE, Coordination Actions, ... as facilitators for this process  
To include OSPAR, ICES , ...

**Why?**

- will ensure that the 'Ecosystem Approach' will merge the different types of valuation, both hard and soft values (link with other ENCORA themes)
- will ensure relevant information for spatial planning
- will ensure quick detection and risk assessment of 'biodiversity problems' (invasive species)
- will ensure the biological information for a sustainable management of natural resources (fisheries, ....)

**AGREED FINAL ACTIONS THEME 07**

**To improve the understanding of how coastal Biodiversity is affected by the mitigation of climate change and how biodiversity can be used to mitigate the effects of climate change**

**Why?**

Investigate the benefits of protection, restoration and recovery of coastal ecosystems and its biodiversity (salt marshes, dunes, beaches, biogenic reefs, ..) as mitigation and adaptation measures  
Effects of climate change on economic goods and services (fisheries,...) of coastal biodiversity.

**What?**

Quantification of the benefits of mitigation by biodiversity and compensation measures

**How?**

Investigate the changes in coastal habitats at appropriate spatial and temporal scales, including experiments

**THEME 7 WORKSHOP PARTICIPANTS**

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# THEME 08

## NEW SUSTAINABLE COASTAL ENGINEERING TECHNIQUES

### THEME 8 RATIONALE

Effective management of coastal zones is crucial. With a proper (also legally supported) coastal zone management policy, many problems in future are to be avoided. However, more or less 'autonomous', 'free' and (in retrospect) 'unwanted' project developments in the coastal zone in the past, might have led to a less desirable situation.

The (not optimal) present situation often calls for protection and preservation of for instance coastal communities. The present situation at coastal community scale is important, but also the expected situation over a timescale of the order of 50 till 100 years. The present autonomous morphological developments of the stretch of coast, but also possible changing developments due to global sea level and climate changes, must be taken into account.

Human involvement with the present situation in a coastal zone and the occurring morphological developments in that zone, leads to notions like 'good' and 'bad' situations and/or developments. Undesirable situations and/or developments must be redressed in better ones. Theme 8 deals with methods and tools to redress these undesirable situations and developments of coastal zones. It is stressed that the notion 'undesirable' is meant from the points of view of people living, working and using the coastal zone. These points of view might be quite different if 'nature' or 'environment' would be a starting point.

The topic is relevant for almost every member state of the European Union. Quite obviously for member states bordering open seas, but the topic might be also relevant for the 'coasts' of large inland lakes.

### THEME 8 OBJECTIVES

Within the basic framework of ENCORA the main emphasis of Theme 8 is on coastal engineering (techniques) related to morphological developments of coasts (e.g. erosion, accretion) and to shore protection (e.g. approach, methods, tools). This means that many other interesting parts of coastal engineering (e.g. breakwater design, offshore platforms, offshore windmills, wave energy conversion devices, port planning and port layout) are not dealt with.

A well-developed system of Integrated Coastal Zone Management (ICZM) is especially important if many different (often: conflicting) interests play a role in the coastal zone. It is felt that along a sandy coast in general more interests must be taken into account than along a muddy coast (compare for instance recreation and housing topics). This means that in Theme 8 hardly any attention will be paid to muddy coasts.

The functional design aspects of a coastal protection scheme are the main items in Theme 8. Although very important in practice, structural design aspects (e.g. how to determine the mass of an armour layer of a submerged breakwater?) are not dealt with.

Coastal engineering techniques are applied (must be applied) in practice when serious 'coast related problems' have to be resolved.

With the help of adequate Coastal Zone Management plans (partly based on fair insights in, and thorough knowledge of, occurring natural coastal processes) many real life management problems of coastal zones and coastal engineering problems might be avoided.

However, many (felt) problems remain; with the help of well-selected, and well-applied coastal engineering techniques one might resolve (some of) these problems.

The notion 'techniques' in coastal engineering techniques is in Theme 8 mainly used as a technique to resolve real life problems. So in Theme 8 'techniques' are mainly meant as skilful and proper applications of (existing and new) methods in coastal engineering to resolve e.g. erosion problems or methods to properly protect a coast.

**A proper application of available tools to protect a stretch of coast, calls for a proper insight in the occurring coastal processes, but calls also for a fair knowledge of the impact the applied tool has on the morphological processes. Insufficient knowledge of the underlying processes might easily result in the selection of an inadequate protection tool. Although morphological developments are a main issue, of course various other aspects (e.g. ecological aspects) must also be taken into account.**

### STATE OF THE ART CONCLUSIONS

The subject of Theme 8 is: 'New sustainable coastal engineering techniques', or more general: 'Coastal engineering techniques'.

The following topics are identified as being of particular relevance:

- 1 Overview of coastal engineering problems to be addressed
- 2 Various types of erosion
- 3 Under-lying causes of problems; morphological developments; quantification of problem
- 4 Design requirements
- 5 Selection of methods and tools ('hard'/'soft')
- 6 Ultimate morphological effects (near field / far field)
- 7 Guidelines for policy makers and practitioners of sustainable approaches

Topics 1, 2, 4 provide the context of the Theme 8 field of interest. With respect to Topics 3, 5 and 6 much is known, and belongs to the skills of a Coastal Engineering expert. However, various lacking items can be identified.

Because of the ever developing knowledge and experience, the content of Topic 7 is permanently evolving. The Coastal Wiki is a very suitable information source, because of the continuous updates and improvements.

## OBJECTIVES OF THE ACTION PLAN

To clarify the dilemma's practitioners or responsible Authorities encounter in selecting, designing and applying coastal engineering techniques in resolving coastal engineering problems.

## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

During the Paris meeting 13 experts from various countries were present. Most of the participants submitted before the meeting a few proposals, as shown in the appendix. During the meeting some of the participants came up with new ideas. The various contributions were discussed in detail and the 2 most relevant proposals were selected, as presented below.

### COASTAL INTERVENTIONS AND NATURA 2000 AREAS

Beaches to be protected belong sometimes to, or are often close to, designated Natura 200 sites or to other ecologically sensitive areas. This might lead to conflicting interests. In the design phase of a coastal engineering intervention project (including the choice of the materials to be applied) Habitats and Birds Directives and other regulations must then be considered as an important set of requirements, apart from the 'usual' requirements like functionality and cost-effectiveness.

The Management Plan for a Natura 2000 area crucially determines how conflicts among various interests will evolve in future. A close co-operation between Management Plan developers and Coastal Zone Managers and coastal engineers is required to end up with feasible Plans.

In order to promote learning from mutual experience among the Member states, a European wide co-operation is proposed. Best practices are to be identified in this challenging topic; clear dissemination is foreseen of lessons learned across Europe.

## HOW TO MANAGE COASTAL PROTECTION MEASURES WHICH HAVE LOST THEIR INTENDED FUNCTION AND OBSOLETE STRUCTURES

Coastal structures are intended to serve specific aims (e.g. to stop coastal erosion or to protect buildings and infrastructure built close to the sea along a coast). Because of deterioration, changing conditions (e.g. sea level rise and climate change) and sometimes because of an apparent failed design in the past, many shore protection measures and structures do exist in various European countries that failed to fulfil their intended functions.

A Generic Design Scheme must be developed for this type of (coastal protection) structures. With the help of such a Design Scheme a responsible Coastal Zone Manager is guided to find a fair ultimate decision to manage the structures further. (Either repairing, improving and adaptation or removing.) Because this issue is important in many European countries, a mutual and co-ordinated approach is recommended. A Generic Design Scheme can also be used if a new project has to be designed.

COASTAL INTERVENTIONS  
AND NATURA 2000 AREAS

HOW TO MANAGE MALFUNCTIONING  
COASTAL PROTECTION MEASURES  
AND OBSOLETE STRUCTURES



**How to manage malfunctioning coastal protection measures and obsolete structures**

**Why?**

In many countries, especially in Central and Eastern Europe, there are shore protection constructions that by definition were supposed to protect the shore but currently are severely damaged or destroyed, or failed to fulfil their functions for other reasons. The question emerges what should be done with those structures.

**What?**

Define a more or less global approach and guidelines.

**How?**

Case studies of past, current and future structure-shore interactions for characteristic situations in order to assess past, current and future developments.

Should they be abandoned, believing they do not pose problems, or should we repair/reconstruct or remove them?

**AGREED FINAL ACTIONS THEME 08**

**Coastal interventions and natura 2000 areas**

**Why?**

Beaches to be protected belong sometimes to a designated Natura 2000 area (or a Natura 2000 area is situated in the vicinity). Conflicting interests arise.

**What?**

Find acceptable procedures for both dealing with European Directives and local interests.

**How?**

European wide cooperation; lessons learned from possible different 'workable' procedures.

**THEME 8 WORKSHOP PARTICIPANTS**

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# THEME 09

## ASSESSMENT OF FIELD OBSERVATION TECHNIQUES

### THEME 9 RATIONALE

Effective monitoring and observation of coastal systems is crucial to the understanding, analysis, protection and preservation of all coastal communities. The time scale for observations is from short (days) to long (decades) to discriminate between inherent natural variability and anthropogenic impacts. The main challenge addressed by this theme, therefore, is to promote the development and demonstration of emerging and new methodologies for the measurement and timely observation of short and long-term physical, chemical and biological changes in coastal and estuarine systems including the effects of climate change and to disseminate this new knowledge across Europe.

### THEME 9 OBJECTIVES

- To stimulate the development and application of emerging methodologies for field observation techniques and monitoring of coastal zones
- To identify key observation techniques for future collaborative research projects
- To promote the application of the State-of-the-Art observational techniques to a range of demonstration field sites across Europe
- To promote the dissemination of good practice guidelines across Europe, e.g. EU-HIMOM, NOKIS (National coastal database); case studies from European countries
- To intertwine existing research and projects in development to promote the development of new observational techniques for the application in coastal and estuarial systems

- To identify, enhance, evaluate and provide access to data bases, e.g. NOKIS, coastDat, and others [e.g. SeadataNet]
- The main challenge addressed by this theme, therefore, is to promote the development and demonstration of emerging and new methodologies for the measurement and timely observation of short and long-term physical, chemical and biological changes in coastal and estuarine systems including the effects of climate change and to disseminate this new knowledge across Europe
- To inform further developments at the European level. Considerable progress can be made at the European level by networking activities to spread existing examples of good practice and research amongst European partners.

**A large amount of information is available on field observation techniques, generally of high quality and good readability, see the Coastal Wiki. However, at the same time there is a need to extend several parts, especially where important information is missing. Generally the monitoring issue is well covered regarding availability of different sensors, but rules and tools as well as guidelines for setting up a monitoring network for a specific question is not available. Remote sensing is not covered well enough to show the strength of its application. The issue of data bases and information management needs further improvements and examples from other countries should be included. The coverage of items is typically northern European, and should be more extending towards the Mediterranean as well as to the Baltic Sea.**

### STATE OF THE ART CONCLUSIONS

- Within theme 9 the following topics were identified as being of particular relevance for the State of the Art overview:
- Compilation of field observation techniques
  - Existing measurement methods for important coastal issues like erosion and sedimentation
  - Measurement methods based on different sensor types for important coastal processes such as primary production, oxygen, pH,
  - Methods to observe the geography of the coast and changes in it
  - Underwater techniques for the observation of physical as well as biological structures
  - Remote sensing techniques to observe habitat structures, water quality and particular compounds

The issue of climate change impacts is an area of rapidly developing research. Policy and practice is still evolving, dependent not only on the science but on the political will to effect the necessary changes.

### OBJECTIVES OF THE ACTION PLANS

- To identify the key scientific and technical issues for advancing observational networks and techniques of coastal and marine waters.
- To identify major unresolved observational issues
- To provide a reference base for future coastal and marine research investments in Europe.

## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

### ISSUES

The topics described in the Appendix have been proposed before the conference. The rationale to study these aspects or take these issues into consideration were discussed during the workshop meetings. Links to other themes were observed in many cases, but it proved difficult to include them all. Some of the topics originally proposed for Theme 9 were identified to match better in other themes (mainly Theme 5, 6, 7 and 8). However, important coastal processes can only be treated if respective observational and modelling methods are available to study their consequences: effects of waves on coastal regions, sea level rise and sediment budgets, effects of climate change on coastal systems, etc. As an essence of the proposed topics the following were identified as main issues and agreed upon as final action plans during the workshop meetings:

- To establish a network of European coastal observatories
- To improve the interfacing between observations and integrated modelling in order to provide long term and real time information services on coastal systems

### CRITERIA FOR RANKING WERE:

- Scientific excellence, break through in the field
- Link to EU Directives, Aberdeen Declaration (policy framework)
- European context and dimension
- Social relevance (safety, quality of life, economy)
- Risk and efficiency, SWOT, feasibility (6 years), sustainability, impact
- Application, usefulness, added value

### OBSERVATIONAL TECHNIQUES AND INSTRUMENTS

Identification of particular missing observational techniques or methodologies that should be developed:

- Develop methods to observe ocean and shelf sea acidification (decrease of pH due to enrichment with CO<sub>2</sub>).
- Develop and improve automatic measurements of dissolved inorganic and organic nutrients (N, P, Si compounds).
- Development of fouling resistant sensors.

### INTERFACE BETWEEN MODELLING AND OBSERVATIONS

The following topics were identified to have a great potential for synergy effects by combining observations and modelling:

- Improve knowledge of water column optical properties to enable e.g. the construction of primary production models.
- Enable turbulence measurements from fixed platforms or naval research vessels to improve turbulence closure schemes.
- Improve knowledge about the evolution of coastal morphodynamics and bathymetry.
- Improved application of remote sensing for European coastal monitoring.
- Develop remote sensing tools for enhanced analysis of cross-shore pathways of sediment movements.

### SUGGESTED PROPOSALS

The following topics were identified for potential future proposals related to observational techniques and methodologies (including modelling):

- Adaptation of marine habitat classification tools to new observation techniques.
- Development of a full scale test bed for acquisition and real time dissemination of environmental and oceanographic data in the Baltic Sea.



- Fill the gap of the tidal interface ("white ribbon") in remote sensing applications as one of the unknown areas devoid of bio-physical information.

### PRACTICE AND POLICY

Standardisation of methodologies and harmonisation of the information management

across Europe are regarded as the main challenges for practice and policy:

- Standardization of coastal observations.
- Establishment of a database on coastal erosion due to extreme storm events.
- Create multidisciplinary databases for information support of ecological research in coastal areas.

TO ESTABLISH A NETWORK OF EUROPEAN COASTAL OBSERVATORIES

IMPROVED INTERFACING BETWEEN OBSERVATIONS AND INTEGRATED MODELLING IN ORDER TO PROVIDE LONG TERM, AND REAL-TIME INFORMATION SERVICES ON COASTAL SYSTEMS



Improved interfacing between observations and integrated modelling in order to provide long term, and real-time information services on coastal systems

**Why?**

There is a separation of the modelling and the monitoring activities, including remote sensing, both of which provide valuable, but sometimes different information to national and international policy makers regarding the status of our coastal waters ('ecosystem approach').

**What?**

Better coordination and cooperation between the monitoring and the modelling communities including data assimilation should provide improved validated models needed for understanding and managing coastal areas.

**How?**

Disseminate and compare results of both activities, develop data assimilation for integrated models, calibration and validation.

**AGREED FINAL ACTIONS THEME 09**

**To establish a network of European coastal observatories**

**Why?**

To set up a firm and trans-national observational basis for sustainable ICZM by a network comprising detailed and coherent spatial and temporal measurements of ecological and oceanographic parameters.

**What?**

To enhance our capabilities to observe state and processes in European shelf seas. This supports an 'ecosystem approach' for managing European coastal waters.<sup>1</sup>

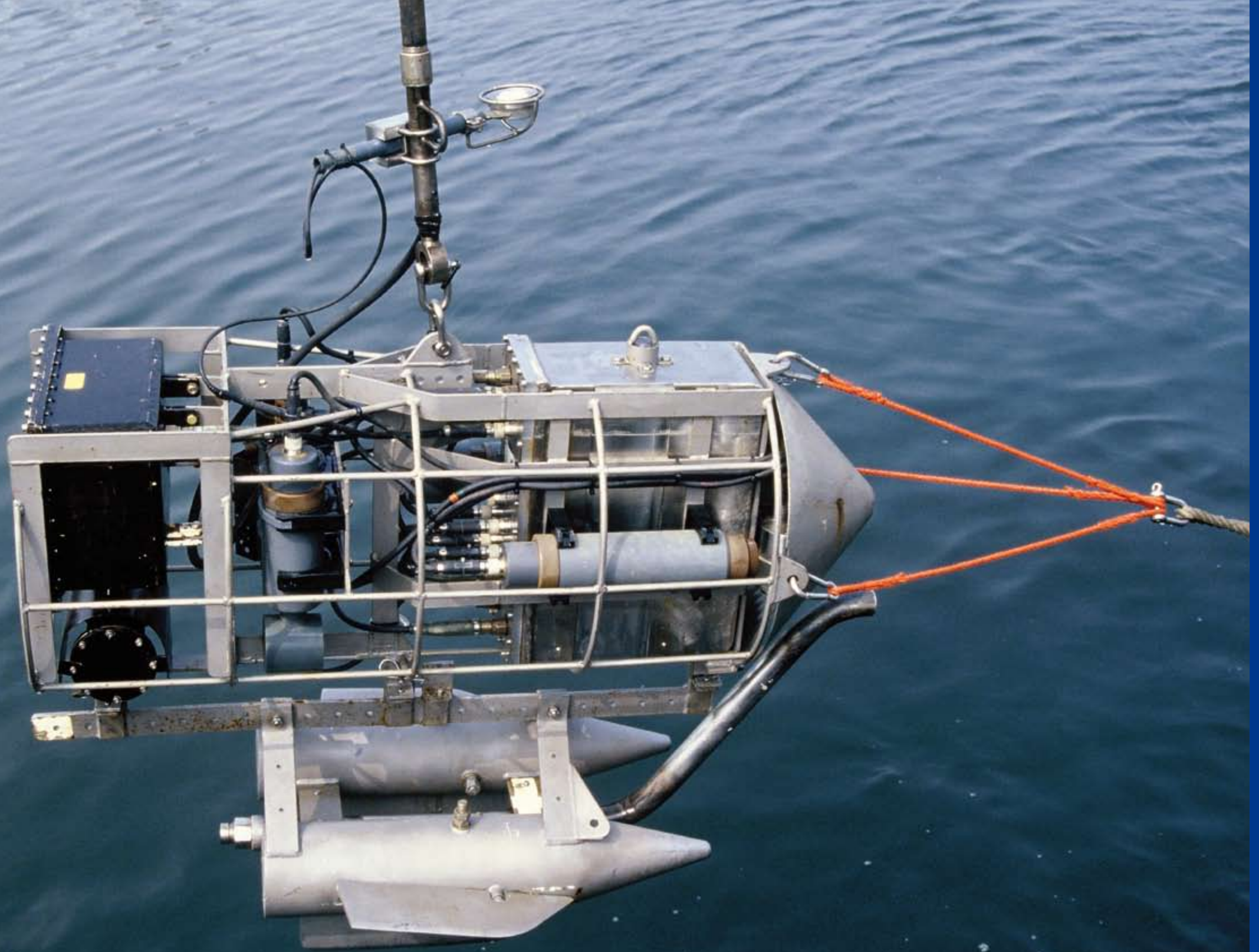
**How?**

Development of new monitoring techniques and sampling strategies, cooperation between national operational coastal and oceanographic agencies, inter-calibration and standardization.

<sup>1</sup> Methods which should be improved are: e.g. biological parameter estimates, underwater light attenuation, turbulence measurements, flux estimates, habitat classification, remote sensing applications for coastal waters.

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# THEME 10

## CAPACITY BUILDING FOR INTEGRATED COASTAL ZONE MANAGEMENT IN EUROPE

ENCORA Theme 10 has produced a 'stand-alone' European Action Plan, which can be found in Appendix 2 and on the theme 10 pages of the Coastal Wiki.

### THEME 10 RATIONALE

The European Action Plan (EAP) on Capacity Building (CB) for Integrated Coastal Zone Management (ICZM) in Europe is a timely product. In recent years, the European Union (EU) has produced core policies having an immense bearing on the future of its coastal areas, such as the EU ICZM Recommendation and the recently signed Mediterranean ICZM Protocol, the Water Framework Directive, the Marine Strategy, and the future Mari-

time Policy, to name just a few. As a result, existing individual and institutional capacities will have to be strengthened by new CB efforts, in order to address the emerging challenges involved in the effective implementation of these far-reaching policy initiatives. The EU has already been endowed with human and institutional resources that have the required competencies for the application of integrated approaches to coastal management. In fact, there is an enormous quantity and diversity of CB initiatives undertaken by different organizations for different target groups. Unfortunately, these initiatives have a limited impact due to fragmentation of the training and educational effort, disconnection between training efforts and management needs and priorities, and the lack of synergy between CB initiatives, thus

individual initiatives often remaining isolated. There is an urgent need to address this situation if the EU intends to address the multiple problems and opportunities that have been identified in recent policies. The EAP is an instrument to achieve this aim.

*form functions in an effective, efficient and sustainable manner. At the individual level, capacity building refers to the process of changing attitudes and behaviours-impacting knowledge and developing skills while maximizing the benefits of participation, knowledge exchange and ownership. At the institutional level it focuses on the overall organizational performance and functioning capabilities, as well as the ability of an organization to adapt to change'*

### THEME 10 OBJECTIVES

Provide guidelines and recommendations both for the European Union and its Member States regarding:

- current state of ICZM capacity building in Europe and prospects for enhancing existing capacity
- Major components of a EAP: human capacity building and institutional capacity building
- Major steps in capacity development, namely:
  - Capacity assessment and needs assessment
  - Creation of a network of National Capacity Resource Centres in ICZM (Capacity BRICs) across Europe
- Design, development and implementation of specific Action Plans

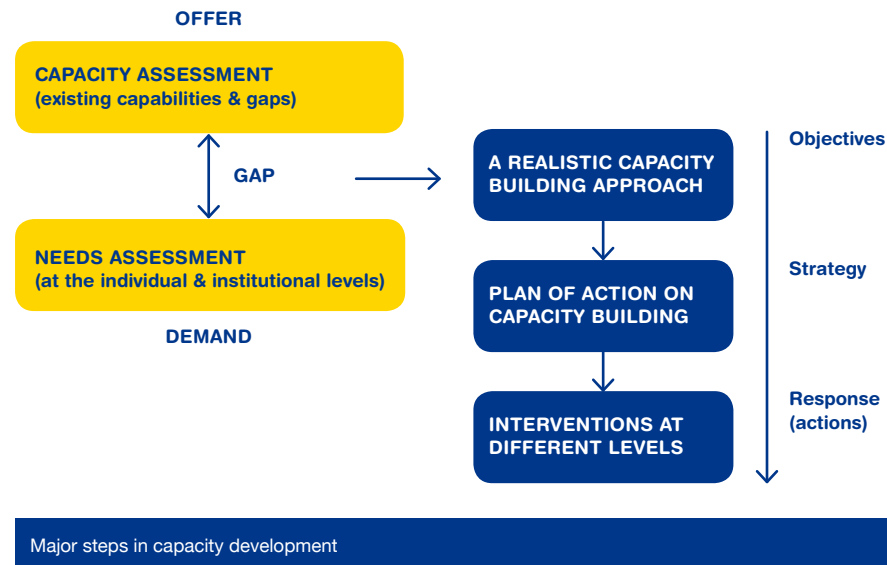
There are several major drivers impinging on the design, and implementation of specific CB interventions. The main drivers from the 'top-down', namely, EU coastal and marine related policies and national ICZM strategies and existing administrative arrangements, all act as powerful underlying forces in a scenario within which CB decisions are made. These decisions, in turn, should be context specific and respond to priority issues that might be tackled through the development of the appropriate human and institutional capacities; these issues should be considered as the 'bottom-up' drivers in the development of specific Action Plans.

A major step in capacity development is to perform a capacity assessment plus a needs assessment that will provide a realistic CB approach, on the basis of which, a AP will be undertaken. In this context, capacity assessment and needs assessment play an extremely important role by providing a real picture of current strengths and weaknesses for performing ICZM that will help to organize existing resources as well as to fill in the identified capacity gaps through CB initiatives. In sum, a simple equation that relates 'What I have and what I need' is the basic driver to capacity building initiatives.

### STATE OF THE ART CONCLUSIONS

From the variety of existing definitions of CB, the one from the United Nations Development Programme (UNDP) has been considered to be the most appropriate within the frame of this EAP:

*'In the global context, 'capacity' refers to the ability of individuals and institutions to make and implement decisions and per-*



## OBJECTIVES OF THE ACTION PLAN

Due to the physical, socio-economic, institutional and environmental diversity of European coastal areas, this EAP provides a generic framework for Capacity Building. Therefore, this EAP is of an *indicative nature* and provides broad guidelines upon which more detailed APs will evolve. These specific APs should be tailored to the particular conditions, needs and expectations of the targeted area. This EAP is geared to the discussion of key CB considerations that are common to all Member States and that will permeate all plans, whether they are developed at the transnational, national or sub-national levels.

The aim of the EAP is to enhance both 'human' and 'institutional' CB efforts across Europe, in support of current or future implementation of ICZM initiatives.

**The EAP is both a reality and a vision. It is a reality because the EAP provides specific recommendations and guidelines for the preparation and implementation of specific Action Plans (APs) at any management level. It is a vision in as much it is an instrument for forging human and institutional resources for addressing current and future problems of European coasts. In fact, the impact of today's measures may render significant results in the medium-term (it is well known that CB results are difficult to measure in the short term). Implementation of this EAP will be the key to securing in the coming years, effective use of existing human and institutional resources, as well as the development of a new generation of coastal professionals and institutional structures and mechanisms ready to respond to Europe's coastal challenges.**

## INITIAL IDENTIFICATION OF KNOWLEDGE GAPS AND RESULTS OF THE WORKSHOP DISCUSSIONS

One of the expected benefits resulting from the implementation of the EAP is, among others, being able to look beyond the short to medium term and develop an influential vision for a wiser long-term use of Europe's existing 'human' and 'institutional' resources. This will lead to more efficient personnel development as well as robust institutional support for ICZM. Due to the unique physical, socio-economic, institutional and environmental diversity of European coastal areas, this EAP provides a generic framework for CB, which should later be turned into more specific national and local APs. These should be tailored to the particular conditions, needs and expectations at different administrative and management levels. Therefore, the EAP has been designed to be an advisory, indicative document, providing guidance and recommendations for the development and implementation of national and/or local APs on CB for ICZM across Europe.

A number of common priority issues regarding the weaknesses in the planning and implementation of ICZM in Europe have been voiced at different forums. However, concerns specifically associated to CB have not been clearly identified nor have they necessarily been singled out for action. Among others, the following issues, particularly associated to CB, have been identified in many reports:

- Lack of sustained capacity and expertise in ICZM within local authorities
- Fragmentation of the training and educational effort
- Training efforts not directly linked with management priorities
- Poor links between researchers and policy makers
- Limited training directed to higher levels of government and decision-making
- Lack or limited mechanisms to transfer courses and experience
- Limited use of need assessments as a diagnostic tool
- Limited use of evaluation tools to identify the impact of the capacity building effort within the working environment
- No synergy between different capacity building initiatives
- Limited use of communication means to capture the attention of the general public and the decision-makers
- Absence of a critical mass of practitioners and policy makers that push ICZM towards the center stage of the economic and environmental goals of a country
- Limited number of ICZM trainers
- Lack of awareness/information on training opportunities, especially for people outside governmental spheres or large institutions
- Need to convince institutions of the need and benefits regarding the training personnel at all levels

**INSTITUTIONAL CAPACITY BUILDING (ICB)**

**HUMAN CAPACITY BUILDING (HCB)**



**AGREED FINAL ACTION PLANS THEME 10**

**Human capacity building (HCB)**

**Why?**

Fragmentation of the training and educational effort, disconnection between training efforts and management priorities, and the lack of synergy between CB initiatives are cited as major concerns and main priorities.

**What?**

HCB addresses the preparation of the required coastal actors to carry out ICZM. It should focus on building an individual's knowledge, skills and attitudes, while at the same time expanding and strengthening the network of individuals by building teams or cadres of ICZM experts across the European region and, potentially, institutions which will signifi-

cantly improve the practice of coastal management. HCB efforts need to be made in two areas:

- (i) to educate and train a cadre of new coastal professionals in the concepts, skills, knowledge and attitudes needed for ICZM; and
- (ii) to re-orient existing coastal professionals entering the ICZM field through single disciplines and sectors

**How?**

There are different types of HCB efforts depending on the coastal actors or target populations. Education/Training:  
 - Bridging the gap between science and management/policy-making through educational programmes also dealing with, for example, the inputs of science to different stages of the ICZM cycle

- Enhancing capacity on ICZM for higher levels of government and decision making
- Creation of a critical mass of practitioners and policy makers that push ICZM to the centre stage of the economic and environmental goals of a country

Professional development:

- Creation of a sustained ICZM capacity and expertise in local authorities

Public awareness:

- Application of communication means for capturing the attention of the general public and the decision-makers
- Creation of support and understanding amongst stakeholders outside the immediate community of ICZM practitioners

**Institutional capacity building (ICB)**

**Why?**

It aims to enhance the capacity of governments, business, non-governmental groups and communities to plan and manage the coast efficiently and effectively. It also aims to improve institutional arrangements for coastal management. This implies addressing CB on a long-term, strategic level. Concepts such as leadership, awareness, and constituency building are part and parcel of institution building.

**What?**

For the purposes of this AP, the institutional dimension of CB is composed by the following major elements:

- Provision of institutional support
  - National Capacity Building Resources Centres (Capacity BRiCs)
- Mechanisms for plan implementation: Partnerships and Networking arrangements
- Supporting elements: transfer of knowledge; sharing of experience & know-how; and dissemination of information

**How?**

*Provision of institutional support - National Capacity Building Resource Centres (Capacity BRiCs)*

Establishment of National Capacity Building Resource Centres (Capacity BRiCs) will support institutions and create a focal point for training/education, professional development, awareness raising, research and information on matters related to CB on ICZM. In fact, the establishment of a network of National Capacity BRiCs may be considered as the key milestone that would mark the advancement of CB efforts in Europe.

*Mechanisms for plan implementation: Networking and partnership arrangements*

Complementarities and integration of CB initiatives themselves are of crucial importance. Since CB will be required at various administrative levels (trans-national, national, sub-national) and for different target populations (senior level, planning and implementation level and the public at large), the use of a variety of means (i.e. partnerships and networking

arrangements) to support capacity development will be necessary. This may result in a large number of cost effective interventions that will avoid 'fragmentation' and 'isolated' approaches that lack sustainability.

#### *Supporting elements*

- Transfer of knowledge of successful approaches on ICZM (e.g. systemic approach) applied elsewhere in order to replicate success and avoid 'reinventing the wheel'
- Sharing/exchange of experience and know-how, e.g. via regional or local meetings, round tables and task forces, electronic discussions, exchange of experts, study visits, and joint activities among Capacity BRiCs and related partners.
- Dissemination of information e.g. to deliver specific targeted information regarding ICZM implications and opportunities to political representatives and decision makers.

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